Thesis

Uncertainty, Cash Flows, and Firms' Investment Decisions in Pakistan

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① Cash flow — valuation
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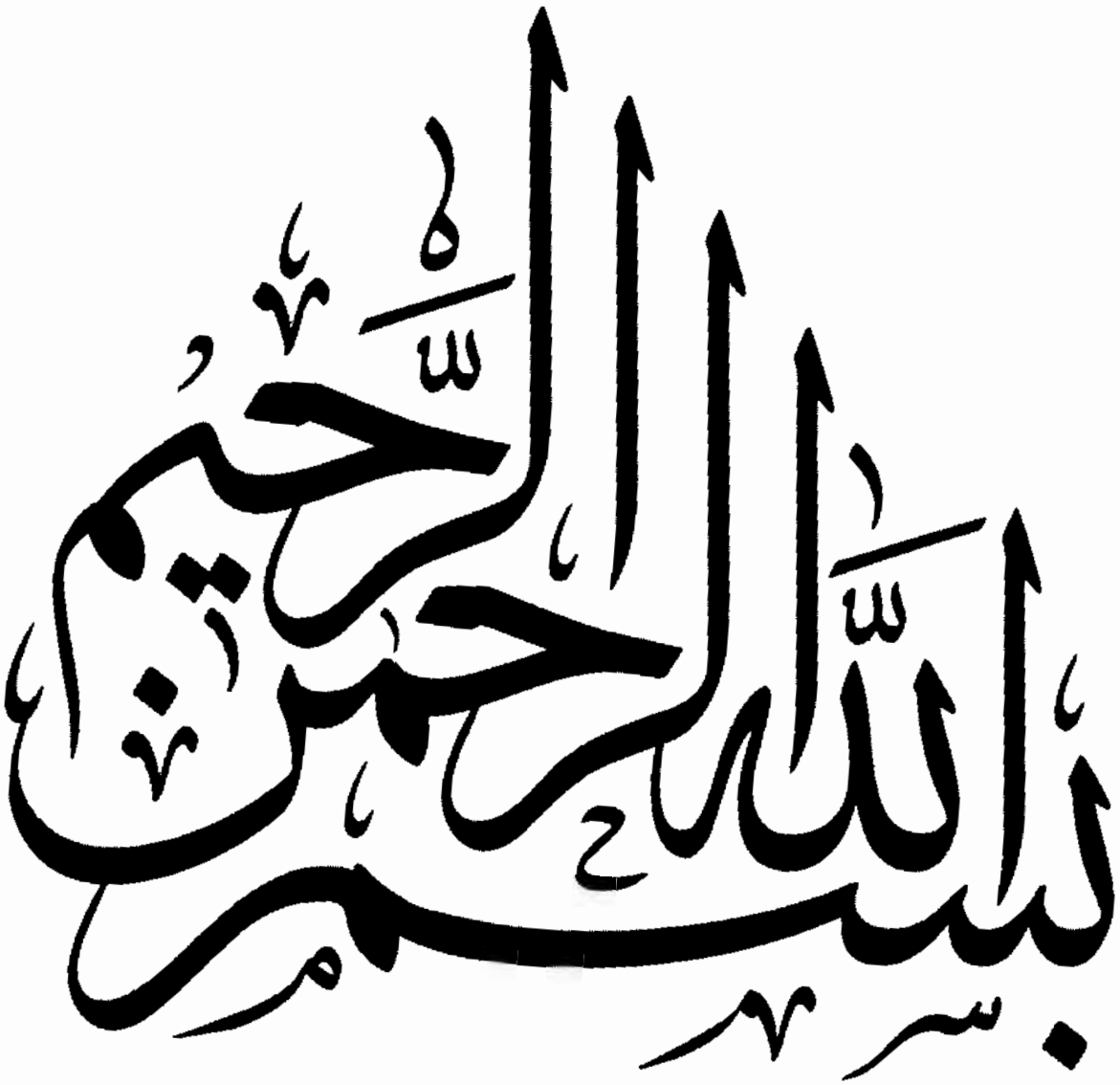
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Uncertainty, Cash flows and Firms' investment Decision in Pakistan

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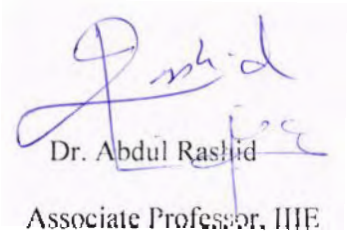
The thesis entitled "**Uncertainty, Cash Flows and Firms' Investment Decision in Pakistan**" submitted by **Ms. Rafia Zafar** in partial fulfillment of MS degree in Economics and Finance has been completed under my guidance and supervision. It is certified that the student has incorporated the necessary changes suggested by the Examiners during viva voice exam on November 14,2017. Now the thesis is ready for further process.

Signature: 

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Dedication

Dedicated to my Supervisor and beloved Parents

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Declaration

I declare that this study is the product of my own original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of Collaborative research and discussions.

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Abstract

This study investigates the analytical and empirical linkages between cash flow, uncertainty, and firms' capital investment behavior of listed manufacturing firms for Pakistan. For empirical analysis of this study, panel data of 403 manufacturing firms covering period from 2000- 2014 is used. The results are obtained by applying generalized method of moment on unbalanced panel data to estimate the relationship between uncertainty and firm investment. Our empirical approach constructs measures of own and market-specific uncertainty from firms' daily stock returns and PSX index returns along with a CAPM-based risk measure. Our results indicate that even in the presence of important firm-specific variables, uncertainty is an important determinant of firms' investment behavior. The findings of the study show that uncertainty and firms' investment are negatively related. Presence of Cash flow effect investment decisions of firm with different intensity. The overall relationship between cash flow and firms' investment is positive for all types of uncertainty other than market uncertainty.

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Chapter 1

Introduction

1.1 Background

Does uncertainty reduce investment? Although majority of researchers would agree to this proposition, their conclusion would lack any solid theoretical ground. The effect of uncertainty on investment behavior is not clear. Investment pattern faces various effects owing to the uncertainty that increases over the costs of input and the product demand. In the light of presumptions, this relationship between investment and uncertainty is due to the innovation of products, administration attitude concerning risk, rivalry among firms' goods, and the state of adjustment costs (Guiso and Parigi, 1999).

Uncertainty is not easy to predict and identify. Due to this, the relationship between uncertainty and firm's investment decision is quite debatable. An investment is the current commitment of funds for a period of time to derive a future flow of funds. These funds will compensate the investing unit for the time the funds are committed, for expected rate of inflation, and also for the uncertainty involved in the future flow of funds (Frank and Kelly, 1982). This study is going to discuss investment in terms of capital investments of firms. Capital investment of firms refers to the production of the firm or the assessment of acquisition of real capital appraised during a particular period of time. In financial terms, capital investment decisions can also be called as 'capital budgeting.' Objective of capital investment decisions is to allot the capital investment

funds of the firm in the most effective manner to make sure that the returns are the best possible ones.

In the business cycle, firms' investment plays a major role. It is valuable to examine the microeconomic decision that firms make to understand the macroeconomic variations in investment. Microeconomic decisions of firms are developing of industrial units, employing workers, exploring of new ideas, and procuring equipment. Over the span of time, researchers have come to know that in investment dynamic, economic uncertainty can be a significant determining factor of investment levels and dynamics (Stein and Stone, 2013). Although understanding how uncertainty affects firms' decisions is vital in macroeconomic analysis, economic theory proposes only unclear predictions and solutions. Since, uncertainty can be found in the minds of buyers, policymakers, and administrators about probable future outcomes. Moreover, uncertainty can also be found in macro and micro phenomena. For instance, GDP and firm growth and non-economic occasions of conflict and environment change.

In business cycle, fluctuation occurs mostly due to aggregate investment spending. However, the intensity through which uncertainty affects investment is not yet clear. Uncertainty affects firms' investment decision through several ways as discussed by investment theories. Hartman (1972) argues that if the marginal profitability of capital is a convex function of stochastic variables one can predict the existence of the positive relationship between uncertainty and investment.

Researchers like Bernanke (1983), Arrow (1986), McDonald and Siegel (1986), and Dixit and Pindyck (1994) emphasize on the role of irreversibility in determining firm-level investment decisions. They argue that monopolistic firms having risk-neutral approach will avoid investment in an uncertain environment when they already have excess of capital stock in their inventory. According to these studies irreversibility causes the firms to decrease their current investment till

the new information become somewhat publicize. For simplicity, because of the opportunity cost in irreversible investment, the value of postponing investment increases and current investment decreases. Pindyck (1988) argues that irreversibility in investment is the reason that can reverse the findings of the Hartman (1972).

One of the main factors that determine the relation between uncertainty and investment is irreversibility. According to the Abel and Eberly (1993, 1994) in a perfect competitive environment, uncertainty and investment have a positive relationship irrespective of incidence of irreversibility. Caballero (1991) did not characterize irreversibility in the investment as a sole reason that can reverse the findings of the Hartman (1972). According to him, presumption about perfect competitive environment and production technology leads toward development of a non-negative association between uncertainty and firm-level investment. Caballero suggests the non-positive association between uncertainty and investment in the presence of imperfect competition and no continual returns to scale production technology. Investment behavior is more cautious under uncertainty and firms prefer to have more updated information as stated by real options of investment. Hence, it delays the implementation of their investment (Dixit and Pindyck, 1994).

The other mechanisms include financial constraint and risk aversions that negatively affect investment (Minton and Schrand, 1999). Entrepreneurs, who are generally more prone to taking risks, will invest more in uncertain events. On the other hand, risk-averse entrepreneurs would avoid investment in an uncertain environment (Nickell, 1978). Financial constraint limits the investment opportunities for firms and hence, increases the probability of existence of negative relationship between uncertainty and investment (Goshal and Loungani, 1997). In an uncertain environment, creditor, who is risk averse, will become hesitant to provide credit.

Economic theory suggests that economic agents consider both type of uncertainty firm-specific and market uncertainty while optimizing their choices. In particular, both types of uncertainty are likely to affect the decisions of economic agents interactively when the agent's behavior is not isolated from others. In exploring the effect of uncertainty on investment, several researchers have examined the impacts of both firm-specific and macroeconomic uncertainty on the value maximization of investment. The impact of micro and macro uncertainty[1] on firms' investment decisions provides inconclusive results in theoretical and empirical studies. Caballero and Pindyck (1996) find that aggregate uncertainty has more prominent effect as compared to idiosyncratic uncertainty. However, Bo (2002) works on Dutch manufacturing firms and she prioritizes the importance of demand uncertainty than aggregate uncertainty. On the other hand, Baum *et al.* (2010) argue that both firm-specific and market uncertainty secure investment. However, Rashid (2011) works on private firms of UK and argues that firms decrease spending on capital investment when idiosyncratic market uncertainty increases. He also finds that the firms' investment is more responsive towards firm uncertainty than to market uncertainty.

One of the main purposes of business while undertaking decision regarding capital investment is to increase shareholders' profit through procuring assets and distributing profit. A firm's rate and direction of growth is decisively influenced by its capital investment decisions. Investment decision making is not an easy task. It is a valuation of forthcoming proceedings, which are problematic to foresee because of the uncertainty in the environment. Subsequently, the extent to which uncertainty affects investment depends on technology, the responsiveness of product

[1] In literature micro uncertainty refers as firm-specific uncertainty and macro uncertainty refers as economic, policy, or market uncertainty. In this paper we use the terms Own, idiosyncratic, firm-specific, micro and intrinsic uncertainty interchangeably. Likewise, Market is taken as synonymous with extrinsic uncertainty and macro uncertainty.

demand with the change in price, and firms' access to the capital market (Goshal and Loungani, 2000).

The accessibility of finance is one of the key factors that restrain investment of firms (Clarke *et al.*, 1992). Uncertainty affects firms' investment through financial constraint. Under uncertainty external financers demand greater returns or limit their exposure if they are not able to assess the investment opportunity accurately. Additionally, under uncertainty investors ask for a premium to purchase a firm's equity. Potential investors are only willing to purchase firms' shares at a reduced price (Schiantarelli, 1996). Oliner and Rudebusch (1996) argue that this partiality would increment external financing cost. External funds are less accessible to firms. In this situation, profits expanded from previous investments should be reserved in order to smooth future investment activities. As a result, investments become very responsive to accessibility of internal funds flow since it is may be less costly than external funds (due to financing constraints). Due to the shortage and less accessibility of internal funds, firms would not have more opportunities to invest in and thus it will have adverse effect on firm profit. When the project is uncertain, it will leads to escalate the value of future investment and reduce the value of current investment. Moreover, in case of growing uncertainty the chances of excess capital stock increase. It causes the firms to reduce their current investment in order to avoid excess capital tomorrow (Fuss and Vermeulen, 2004). There is no doubt that uncertainty affects investment pattern. However, the magnitude to which uncertainty effect investment will vary in the presence of cash flows. If a firm has a stable cash flow it is highly unlikely that it opt for extravagant external financing. Likewise, investors prefer firms with smoother cash flows relative to firms with more volatile cash flows. Liquidity ratios of firms having different characteristic based on their size, industry and financial position deviate in the existence of market friction. Firms having less accessibility to the external finance retain cash

flows by persuading a no dividend policy Myers and Majluf (1984). When the external financing become costly, firms likely to invest in liquid assets (Kim and Sherman, 1998). Therefore, it can be conclude from the prior research that the availability of cash flow is an important factor in examining the capital investment behavior of firms.

External finance is influenced in the presence of uncertainty which ultimately affects firms' investment decisions. In order for lenders to demand higher return on loans and for investors to demand a premium to purchase firms equity, it is necessary to know certain aspects. First, the extent to which uncertainty affect firms investment decisions. Next, the indirect effect of uncertainty on investment in the presence of cash flow. This study is conducted to analyze the impact of cash flow and uncertainty, which may arise from various sources on the investment decision problem of manufacturing firms' in Pakistan.

1.2. Literature Gap

Uncertainty has many sources which incorporate economic situation of input and demand market, progress in innovation, the aggressive market condition, and financing accessibility. When faced with such uncertainty, firms must make investments wisely as they affect the firms' future financial gains. Depending on how uncertainty is resolved, firms' profit is affected differently. Investment behavior tends to become more cautious under uncertainty. Many studies have been conducted to investigate the relationship between uncertainty and firms' investment for other countries. Like Baum *et al.* (2010) inspect the relationship between uncertainty and firm level investment. Their results indicate that market uncertainty negatively affects investment through cash flow. On the other hand, idiosyncratic uncertainty has a positive effect on investment. Rashid (2011) finds the impact of idiosyncratic and market uncertainty on investment for the

manufacturing firms of UK from 1999-2008. He argues that as idiosyncratic or market uncertainty increases, firm decreases expenditure on capital investment. He also unfolds that the investment of private firms are more reactive to firm uncertainty as compare to market uncertainty. Kang *et al.* (2014) discover the impact of policy uncertainty (extrinsic) along with firm uncertainty (intrinsic) on investment. They use daily stock return to calculate monthly stock volatility for firms using methodology developed by Boom *et al.* (2008) and also the Merton methodology as a measure of annual stock instability. They argue that the policy uncertainty has a high impact on firm-level investment when there is higher level of investment, especially in recession. One of the most important gaps in the existing literature is that researchers have extensively examined the uncertainty-investment relationship for firm-level data in developed countries but a little attention has been paid on developing countries. Therefore, empirical evidence on how firm-level investment responds to uncertainty in developing countries is rather limited. However, evidence on the investment sensitively of uncertainty for developing countries is important for our understanding of the uncertainty-investment association. The environment under which firms operate and the product market structures in developing countries are different than in developed countries. Further, firms operating in developing countries are likely to be affected more adversely by uncertainty as they are relatively more financially constrained due to financial market imperfections. To empirically examine how firm-specific and macroeconomic uncertainty affects corporate firms' investment decisions, firms operating in Pakistan seem highly relevant and interesting case. In these days, Pakistan is suffering much from several economic and political problems. For instance, war on terror, anti-corruption movements, energy crises, trade deficit, and high level of debt burden caused great uncertainty about macroeconomic conditions. These economic and political issues have also badly affected firms' business activities, which, in turn, increased the risk associated with their operations. Thus, it would be useful to explore the impact

of both firm-level and macroeconomic uncertainty on the investment decisions of corporate firms operating in Pakistan. Therefore, we test our proposed model using a firm-level data from Pakistan as we expect relatively more pronounced effects of uncertainty on the investment behavior of firms. As various studies show, when there is a change in uncertainty with the passage of time, lenders become more cautious about firm's creditworthiness. In such circumstances, lender demand more risk premium to provide funds as uncertainty around increases. Thereby, the study examines the relationship between cash flow and capital investment when there is a change in uncertainty with the passage of time in case of Pakistan. Furthermore, this study intends to provide empirical confirmation about the relationship among different measures of uncertainty, firms' cash flow, and decisions about capital investment of the manufacturing firms of Pakistan.

1.3. Objectives of the Study

The main objective of this study is to examine the impact of firm-specific uncertainty, and market uncertainty on capital investment decisions of Pakistani manufacturing firms. The study also examines the indirect relationship between uncertainty and investment through cash flows. In other words, the study explores whether the presence of the cash flows does change the response of firms toward uncertainty. Extended Q model is used to check the direct and indirect effect that will be generated through different sources of uncertainty and cash flow on the investment decisions of firms.

1.4. Research Questions

- How does the intrinsic and extrinsic uncertainty affect manufacturing firms' investment decisions in Pakistan?
- How does the relationship between firm-specific and market uncertainty affect manufacturing firms' investment decisions of Pakistan?

- How do the uncertainties affect investment behavior of firms in Pakistan through firms' cash flow?

1.5 Significance of the Study

Investment helps firms in boosting up their share value in market. The profit firms generate through investing in capital market is a source of motivation for further investment in capital asset. Moreover, production capacity increases because of the firms' investment in capital goods which in response is very helpful in growing consumer market demand. Investment is a way for firms to increase both their market value and profit.

Thus, it is very important to capture those variables that effect investment, especially the uncertainties that arise from different sources. Understanding the sources of uncertainty will help firms in mitigating risk. The measures of uncertainty (volatility in stock price, and market index) will be helpful for individuals, institutional investors and managers in assessing the investment behavior sensitiveness towards firm-own and market uncertainty. While investors carefully choose a way to invest, mangers would take action to control and mitigate risks that are more concern to investors. The interaction of cash flows ratio to the uncertainties will help mangers to become more cautious about their management decision because the magnitude to which uncertainty effect firms' investment decision varies in the presence of cash flows. This study aims to show the importance of controlling micro and macro uncertainty. Furthermore, how this controlled uncertainty will improve firms' investment decisions. Policy makers with their lenient policies can help firms in enhancing their investment decisions.

1.6 Study Plan

The rest of the study is organized as following. Chapter two discusses literature review. This chapter is divided in 4 subsections. Section 2.1 consists of theoretical framework. Section 2.2 discusses the relationship between idiosyncratic uncertainty and investment. Section 2.3 discusses relationship between market uncertainty and investment. Section 2.4 discusses cash flows and investment relationship. Chapter 3 presents the data collection criteria and uncertainty measure. It is divided into 6 subsections. Section 3.1 and 3.2 discusses data collection, sources, and selection criteria. Section 3.3 discusses model, it also describe the empirical requirement for the mode. Section 3.4 discuses variables of the model and construction of their proxies. 3.5 discusses construction of measures of uncertainty and 3.6 discusses the GMM estimation technique. Chapter 4 discusses the findings and results. Chapter 4 is divided in 4 subsections. Section 4.1 discusses summary statistics of all the variables. 4.2 discuss the result of the effect of uncertainty on capital investment of firms. Section 4.3 discusses findings of the effect of cash flows on investment decisions of firms. In Chapter 5, conclusion is argued. It is divided in to 4 subsections. Section 5.1 discusses brief background of study. Section 5.2 discusses key findings of the study. Section 5.3 discusses policy implications and limitations of this study.

Chapter 2

Literature Review

2.1 Theoretical Framework

A relationship exists in literature between uncertainty and investment. The link between the two is established by certain causes and their entwined effects. These causes and effects are discussed using theoretical concepts and relevant empirical evidence in the literature. Uncertainty arises from sources like changes in profit, output or investment prices, marginal returns, wages, product demand, and other financial factors. Uncertainty needs to be identified with in due time in order to established a risk base framework. The prevailing source of uncertainty must be known in order to examine the relationship between uncertainty and investment.

2.1.1 Production Technology

According to Caballero (1991) investment has a negative response to uncertainty when a firm operates in a non-perfect market. However, Caballero viewed the firms in isolation. Firms with higher levels of risk aversion are more prone to have lower inputs and outputs, according to the theories related to risk preferences. Appelbaum and Katz (1986) and Hartman (1976) illustrate that managers emphasize on bad outcomes rather than the good ones. Gul's (1991) model shows that a risk-averse investor will be in problem with diversifiable risk. They will be more concerned about the market returns and firm covariance rather than uncertainty faced by a firm in isolation. Diversifiable portfolio risk is represented with an increase in the covariance of a firm's return

and market returns. Thus, investment is discouraged as the required rate of return is increased (Panousi and Papanikolaou, 2012).

2.1.2 Irreversibility

Firms choose to wait until information gets certain about the cost condition, future demand and other factors relevant to the investment, in the case of an irreversible investment. According to real options theory on investment, an irreversible investment is an option where a firm, at any point in time, may choose to either invest instantaneously or delay it and observe how the investment's payoff would grow (Dixit and Pyndick, 1994). Largely, firms only choose to invest after they observe that the profit of the product has gone beyond a certain threshold level. Under general presumption, uncertainty and threshold share positive relationship (Caballero and Pindyck, 1993). In the presence of partial irreversibility, the high uncertainty implies that the higher threshold level is required to rationalize positive investment and the lower threshold is necessary to rationalize disinvestment Bloom (2000) and Abel and Eberly (1999). The response of investment to demand shock will reduce in the presence of optimal investment policy.

2.2 The Link between Uncertainty and Investment

A great amount of effort has been put in by researchers in order to investigate the linkages between uncertainty and firm level investment. Multiple sources of uncertainty like changes in cost, sales, output, policy and interest rate may influence firm level investment. For instance, uncertainty and an aggregate investment have a negative relationship in case of uncertainty derived out of output growth. On the contrary, uncertainty when caused by inflation has no impact (Driver and Moreton, 1991). Uncertainty resulting from interest rate has no effect on investment according to Calcagnini and Saltari (2000) but demand uncertainty and investment share significant negative relationship.

Von Kalckreuth (2000) scrutinizes the effect of sales and cost uncertainty on investment. He finds that both type of uncertainty sales and cost are of identical significance for investment and both uncertainty measures share negative association with investment. Similarly, Byun and Jo (2015) find the impact of profit uncertainty on investment for Canadian manufacturing firms over the period of 1984-2012. They argue that profit uncertainty has a significant but negatively small effect on investment. Masayuki (2016) finds the impact of business uncertainty on firms' investment by using business survey data in Japan. The findings show that first, manufacturing and small firms are likely to face higher business uncertainty as compare to non-manufacturing firms. Second, Masayuki (2016) also shows a non-positive association between business uncertainty and investment. Finally, he concludes that business survey micro data constructed uncertainty measures are better as compare to uncertainty measure constructed from the publically listed data.

2.2.1 Firm-Specific Uncertainty and Investment: Prior Evidence

Previous studies observed collective effect of firm-specific uncertainty on firms' investment behavior. According to the Caballero (1991) with an infinite industry elasticity of demand, the value of delaying investment vanishes, and investment increases with an increase in idiosyncratic uncertainty. This result holds irrespective of the presence of irreversibility and asymmetric adjustment costs. Henley *et al.* (2003) conclude a non-negative association between investment and firm-specific uncertainty. Mustafa and Olexander (2007) find the relationship between firm inventory accumulation and uncertainty. Gilchrist *et al.* (2014) work on investment irreversibility and idiosyncratic uncertainty. They determined that because of the irreversibility in investment, firms approve a wait-and-see attitude in reaction to the increase in uncertainty. The impact of uncertainty on investment occurs mostly because of fluctuations in credit spreads and

advancement in credit spreads have a strong impact on investment, regardless of the level of uncertainty (Gilchrist *et al.*, 2014).

Particular studies demonstrate a negative relationship between uncertainty and investment. Like Lee (2005) examines the sensitive nature of investment to uncertainty. 1997's financial crisis in Korea is examined to check the prior and post crises impact of uncertainty. To construct uncertainty measure, investment over stock ratio and daily stock revenue volatility is used. He finds that the overall sample of Korean manufacturing firms shows a negative impact of uncertainty on investment. The relationship between investment and uncertainty tends to be more significant after a crisis rather than before it. Lee (2005) explains the reason for this result that the government provided support to firms with respect to loss coverage before the crisis. Hatakeda (2002) finds a negative connection amongst uncertainty and investment for all the firms included in the sample. Ghosal and Lounghani (2000) examine uncertainty's impact on investment in large and small business set ups and they conclude the relationship between uncertainty and investment is almost negative. Their study uncovers more complicated findings related to the asymmetric effect across firm size. The dominating group in their small size firm is likely to be inconsistent when there is a presence of large sunk cost, which makes it difficult to contend variability of risk preference according to firm size. The firm which borrows from external capital markets is more prone to face a premium because of the unsymmetrical data among borrowers and loan specialists as suggested by financing constraints.

The impact of idiosyncratic uncertainty on investment is also examined by Peeters (2001) for Belgium and Spain. The firm-specific uncertainty measures have been calculated for sales and prices. According to the results the demand and price uncertainty has a significant correlation with corporate investment, indicating that investment may be influenced by these types of uncertainty.

Then, the effects of uncertainty are included in dynamic equations of investment, including account price levels, debt-to-capital ratios and average capital productivities. Output price uncertainty depresses investment in Belgium and Spain is shown by GMM-results. Another conclusion that he makes is that a sales uncertainty effect is less clear on investment behavior and investment price uncertainty does not render any effect, and is thus seemingly insignificant. Hatakeda (2002) finds a negative relationship between uncertainty and firm investment after examining it. The relationship between government policy and stock prices is observed by Pastor and Veronesi (2012). The findings show that the stock prices will fall as a new government policy will be announced. The intensity of the changing government will influence the intensity with which the stock prices would fall. Byne *et al.* (2015) investigate the relationship between firm-specific uncertainty and corporate failure, for the UK firms over the period of 2000 -2009. They distinguish firms on the basis of their dependence on bank finance and they also separate public firms from non-public ones. The result show that uncertainty and firm survival shares a strong association and this connection is more solid amid budgetary emergencies. Jens (2016) surveys the association between political uncertainty and firm investment by using the US election as a source of disparity in uncertainty. His findings show that before the election, investments reduced by 5% and firms stall SEOs tied to investment under higher uncertainty.

One of the challenge in the study is to discover an appropriate proxy for measuring uncertainty. This is primarily because uncertainty is unobservable and consequently econometrician needs to use an intermediary in empirical modeling. It is clear that there is no hard and fast method to measure uncertainty but rather an extensive pool of proxies are available for measuring uncertainty. For uncertainty, the GDP or the instability of the stock market is made use of as a proxy. Other common sources for measures of uncertainty are the shock to firms, references of uncertainty in news and forecaster disagreement. Proxies based on firm's stock returns are the

most applicable in particular. Leahy and Whited (1996), Bloom *et al.* (2007), Baum *et al.* (2008), Bloom (2009), and Panousi and Papanikolaou (2012) claim in a related literature about firm stock price instability and firm-level choices, that the firm's own stock price volatility can denote the uncertainty faced by the particular firm. In a model presented by Bloom *et al.* (2007) it is shown that a firms' irreversible investment is reduced by uncertainty as a reaction to sale shocks. According to their study firms turn out to be more ready during that season of year when firms have an increased instability and fluctuation in their daily stock return. Leahy and Whited (1996) examine a period of 1981-1987 for U.S manufacturing firms and ascertain a negative relationship between firms' daily volatile stock returns and investment.

2.2.2 Micro and Macro Uncertainty and Investment: Prior Evidence

In order to determine the value maximization level of firms' investment, economic theory proposes an important role of both macroeconomic and idiosyncratic uncertainty. Although, across different industries the marginal effects of these two types of uncertainty may vary. The currently available literature fails to provide conclusive results on the effect of macro and micro uncertainties on firm level investment. For instance, Bo (2002) observes Dutch listed manufacturing firms over a period of 1984-1995 and the impact of idiosyncratic demand uncertainty on investment. She suggests through her findings that the demand uncertainty lowers firm investment effectively. She uses the GMM estimator to get his findings. In addition, this study highlights the importance of demand uncertainty to aggregate uncertainty.

In another study by Caballero and Pindyck (1996), the stronger impact of aggregate uncertainty on industry balance is found when compared and contrasted to firm-specific uncertainty. Likewise, Baum *et al.* (2010) locate that fixed investment is boosted both by extrinsic and firm-specific by

observing U.S manufacturing firms over a period of 1988-2005. In the same way, Rashid (2011) examines UK private manufacturing firms over a period of 1999-2008 to find the impact of idiosyncratic and market uncertainty. According to the findings, with an increase in idiosyncratic or market uncertainty, firms decrease expenditure on capital investment. He also finds that the private firm investment is more prone to sensitivity towards firm uncertainty rather than market. Kang *et al.* (2014) discover the effect of policy uncertainty (extrinsic) alongside with firm uncertainty (intrinsic) on investment. They calculate the monthly stock volatility by using daily stock return and the methodology advanced by Boom *et al.* (2008). They also measure annual stock volatility by using the methodology of Merton. They maintain that with a higher level of investment, the impact that policy uncertainty has over firm investment is also high, particularly during a recession.

Huizinga (2011) finds that the price uncertainty tends to have a positive effect on investment, whereas wage and materials cost uncertainty negatively effects investment. Leahy and Whited observe a sample of Belgian and Spanish firms and find that investment is decreased by larger stock price uncertainty. Financially constrained firms cause uncertainty to effect investment badly. Generally, the qualitative and quantitative relationship between uncertainty and investment varies across multiple researches. Researchers have failed to agree on any specificities through which the effects of uncertainty operate. In order to understand the mechanisms of the effects of uncertainty more evidence is required. According to Foster (2000) and Krizan (2006), managers make investment decisions more carefully in the presence of greater uncertainty. Due to this, there is a positive outcome across firms on the productivity-enhancing reallocation of resources. Bloom (2013) analyzes the data of 1100 Dutch firms, all medium and small in size, and scrutinizes the relationship among uncertainty and firm growth. He stated that firm investment is effected

positively by sales uncertainty. Masayuki (2016) finds a negative association between business uncertainty and investment. He concludes that when business uncertainty heightens, companies reverse their investment projections downward.

2.2.3 Cash flow and Firm Investment: Prior Evidence

The effect of financial frictions on investment choices has been a fundamental debate in present-day business. Even though, the recognition of financing-speculation cooperation is not a simple undertaking. In order to understand the relationship between fixed investment and uncertainty in the existence of financial gaps, the contemporary discoveries over what cash flow has to do is needed to be discussed in that context. Numerous empirical reviews discuss the significant impact of cash flows on investment, regardless of the possibility that Q is incorporated as an informative variable. The impact of information asymmetries and financing constraint for certain sorts of borrowers is inspected by Greenwald and Stiglitz (1990). They show that under general conditions of investment and firm equity, greater uncertainty about the profit yield builds the incremental danger of insolvency. Therefore, as a result, firms decrease their investment as they cannot face the additional risks by distributing more equity. Thus, due to the uncertainty, many entrepreneurs may have to rely only on their own internal funds, while others could get funding for their projects by equity or loaning from the bank. Therefore, it can be suggested in the aforementioned theory that the effects of profit uncertainty on investment may vary across firms depending upon their access to capital markets. The proxy used by Fazzari *et al.* (1988) and Gertler and Gilchrist (1994) for measuring capital market access is firm size.

Fazzari *et al.* (1998) argue that in the presence of blockage among internal and external funds cost, sensitivity of the internal funds to investment should increase. An outcome is provided by the

literature detailing the affectability of firms' investment to changes in their internal money streams. It is interpreted as a confirmation of financing imperatives by Fazzari *et al.* (1988). Firms make their investment decisions by taking into account all their choices regarding internal funds, capital structure, debt and equity financing, as external funds are expensive because of problems in financial markets. There are studies present in the literature that have been conducted to examine the linkage between investment and cash flow. According to Fazzari *et al.* (1998) an investment policy which dissipates their internal funds also constraints the already financially constrained firms. The investments made by constrained firms equal their asset sales and cash flow when they do not hold enough funds to invest as much as they need to. In such a situation, there is a quite strong link between cash flow and investment. Firms which are constrained and do not have enough funds to invest tend to be more sensitive to the ups and downs of cash flow compared to other firms. It is stated by the corporate risk management theory that shareholders are better off if a firm keeps a smooth cash flow. Froot *et al.* (1993) state that by decreasing a firms dependence on costly finance, firms smooth cash flows can raise.

Minton and Schrand (1999) study how cash flow volatility impacts discretionary investment along with the cost of debt and equity financing. They find that a downward spiral in internal cash flow is indicated by the cash flow volatility. Cash flow instability has a worse association with S and P bonding rating, a higher yield to maturity and weighted average cost of capital, high bid and asks spreading, lower dividend payout and lower analyst following. Correspondingly, Agca and Mozumdar (2008) take US manufacturing firms to inspect the bondage of cash flow and investment over a period of 1992-1995. In their study they include five elements which are identified with imperfection of capital market. The elements are as follows: institutional ownership fund flows, bond rating, and index of anti-takeover amendments. The findings of the study show

that with an increase in fund flows, institutional ownership, anti-takeover amendments, bond rating and analyst following; the sensitivity of cash flow investment decreases. Gayane and Hovakimian (2005) divide firms on the bases of their non-positive, increasing, and decreasing sensitivity to understand cash flow sensitivity. The study concludes that firms which are categorized into different groups based on the sensitivity of cash flow investment are expressively not quite the same as each other. Particularly, the firms which are characterized as negative cash flow sensitive usually have the most elevated potential development, the lowest levels of internal liquidity, and tend to appear as the most financially constrained. The largest amounts of internal liquidity, the lowest potential growth opportunities, and the appearance of being the least financially constrained are seen for firms which are insensitive to cash-flow.

A one-period model develops by Almeida and Campello (2001) which show that firms which may have faced credit constraints. Firms which are unconstrained do not show cash sensitivity, while firms which are credit-constrained are positively affected by cash flow sensitivity. As the available collateral increases for a credit-constrained firm, so does its sensitivity. On the other hand, the one-period model presented by Povel and Raith (2001) rather than forcing credit requirements concentrates on investment which is not observable by the market. Their findings show that a U-formed connection is identified among cash flow and investment, cash flow affectability increases with an increase in the availability of asymmetry information. According to Dasgupta and Sengupta (2003), the market cannot observe the investment. They use a two-period model and find that investment and cash flow have an ambiguous relationship. Moyen (2004) examines financially constraint and unconstraint firms and the investment-cash flow relationship they demonstrate. She argues that lower cash flow sensitivity is exhibited more by financially constrained firms rather than firms with no identifiable financial constraints. Markovic and

Stemmer (2017) analyze the effect of internal financial constraint on firm growth by using a data of unlisted Serbian firms from 2005 to 2012. Their results show that Serbian firms face high financial constraint, hence, they are highly dependent on retained earnings for firm growth.

A closed-form solution is developed by Abel and Eberly (2011) for Tobin's Q in a stochastic dynamic framework. They dispute that investment is emphatically identified with cash flow and Tobin's Q even when the financing friction is absent. Q and investment are likely to positively rise up with any changes expected in revenue growth, both Q and investment are directly proportional. Their findings reveal the higher effects of the dynamic association among cash flow, investment and Q on smaller and fast-growing firm cash flows. Furthermore, no incredibly large adjustment costs are suggested in the model between the empirical sensitivity of investment and Tobin's Q, since there are no adjustment costs. Investment is less sensitive to Q and more sensitive to cash flow, and both these reactions are justified by a reasonable scale of empirical evidence.

Although, uncertainty affects investment decisions, the magnitude and extent to which uncertainty affects investment is different across different firms depending on their access to the capital market. Uncertainty in any form is not gladly received by investors and mangers because it increases cost of external finance for firms and risk for investors. Although previous researchers have investigated the relationship between idiosyncratic and market uncertainty on investment decisions of firms, we have no study yet that have incorporated the effect of firm-specific, market and CAPM based uncertainty in a regression model in case of Pakistan. To fill this gap, this study analyzes the impact of firm-specific, market uncertainty and their covariance on external financing cost of firms and consequently on investment decision of manufacturing firms in Pakistan. In general it is contemplated that larger amount of cash flow unwind borrowing limitations and more elevated amount of uncertainty increment money related contacts. Potential lenders while making

lending decisions consider perceptible money streams as well as uncertainty identified with the environment of firm. Thus, this study also examines the impact of uncertainties on investment behavior of manufacturing firms in Pakistan through firm cash flows. Keeping in view the degree of financial friction is connected to the cash flow of firms as well as to the extent of uncertainty confronted by the firms.

Chapter 3

Data and Methodology

This chapter contains information about data sources, screening and selection of data. Model that is being used in this study is specified along with the variables included in the model.

3.1 Data

This study uses panel data to inspect the association that uncertainty and cash flow interaction share with firms' capital investment behavior in Pakistan. The unbalanced panel of manufacturing firms from the period 2000 to 2014 is used as a sample. Sources of uncertainty being taken into account includes intrinsic, extrinsic, and linkage between intrinsic and extrinsic through CAPM based risk measure beta. Data on firm-specific variables are gathered from State Bank of Pakistan under the publication "Balance Sheet Analysis of Financial and Non-Financial firms" listed at Pakistan Stock Exchange. The website of stock exchange plays a key role in unfolding information concerning the instability of every day stock returns of firms and unpredictability of market return.

3.2 Sample Selection Criteria and Initial Screening

This study only emphasizes on the manufacturing firms and omits firms that have variation in their accounting cycle. We have not included those companies in our initial screening that do not have consecutive data of less than 3 years on the variables like investment, cash, prices of shares, debt and asset. The study contains panel of unbalanced information where the observation of companies participating from 3 to 14 years is analyzed. The chance of the existence of biasness is possible, because of the entrance and way out to the panel data are made during the period of sample. In the

following subsection, construction of variables and uncertainty measures are being discussed in detail.

3.3 Model

The investment literature has used different methods to measure uncertainty and considers different sources of uncertainty. This study considers the impact of three various types of uncertainty on external financing cost and in this manner on their investment decisions: Intrinsic (firm-specific) uncertainty, extrinsic uncertainty, and the connection among firm-specific and extrinsic uncertainty.

There are different investment models which have been used in different studies to check the investment behavior. Like Byon and Jo (2015) use investment forecasting model. They use sales revenue, cash and cash equaling and size as well to explain the firms' future profitability and its capital investment decision. Bond and Cummins (2004) use average q, measure of uncertainty and growth in sales to find investment rate. Ideal rivalry was there in an investment model that is being used by Hayashi (1982). In his Q model, uncertainty impact is summarized by the normal q proportion which was an adequate measurement of investment. We use extended Q model of firm used by Baum *et al.* (2010). The original model is proposed by (Blunder *et al.*, 1992). The present value of the firm is denoted as the expected discounted stream of D_t, dividends paid to shareholders:

$$V_t = \max E_t \left[\sum_{s=0}^{\infty} \rho^s D_{t+1} \right] \tag{3.1}$$

Given the equation of sources and funds:

$$D_t = \lambda (K_t) - C \left(I_t, K_t, \varsigma_t \right) - I_t + B_{t+1} - B_t R_t, (2) \tag{3.2}$$

$\pi\ (K_t)$ is defined as current profit value for the beginning period of capital stock, $C\ (I_t, K_t, \varsigma_t)$ is defined as the real cost of adjusting. where,

I_t is used as the new capital unit.

ς_t is the additional impact to adjustment costs

B_t is external finances

R_t, is the overall rate of interest. We are only checking the function of debt funding. Hence, it is presumed that financing through selling shares is costly. Therefore, debt financing is considered as more preferable by the firms. Firm optimization faced two hurdles:

$$K_t, = (1 - \delta)K_{t-1} + I_t, \tag{3.3}$$

$$B_{t+1} \leq B^*_{t+1}. \tag{3.4}$$

Equation (3.3) shows the development that the capital stock goes through. Where, I_t is the overall expenditures of investment. Likewise, δ is the capital depreciation rate. Equations (3.4) reveals that the borrowing made by firms is less than the total debt ceiling provided, for instance, B^*_{t+1}.

The transitivity condition that the firms encounter keeps them from over borrowing and then distributing it to the shareholders as dividends.

$$\lim_{T\to\infty}\left[\prod_{j=t}^{T-1}\rho j\right]B_T = 0, \forall t \tag{3.5}$$

The capital and debts after taking investment's first order condition are,

$$\frac{\partial C_t}{\partial I_t} + 1 = \lambda_t \tag{3.6}$$

$$\frac{\partial \prod t}{\partial K_t} - \frac{\partial C_t}{\partial K_t} = \lambda_t - (1-\delta)\rho E_t \lambda_{t+1} \quad (3.7)$$

$$E_t[\rho R_{t+1}] = 1 + \mu_t, \quad (3.8)$$

The marginal cost is shown in equation (3.6). This cost is related to extra units of investment where the shadow price is equivalent to it. Equation (3.7) shows two things. The capital's first-order condition and the development of λ_t described by the Euler equation. The additional cost i.e langrage multiplier is supposed to lie beyond risk free rate caused by the financial gaps faced by the firms. The possible assumption about the one dimensional homogeneity associated with the profit function and the combination of equation (3.6) and (3.7) give rise to equation (3.9).

$$\pi_t(1-\delta)K_{t-1} = D_t + B_{t+1} - R_t B_t + \rho E_t[\lambda_{t+1}(1-\delta)K_t] \quad (3.9)$$

Likewise, the use of firm value and debt's first order condition gives us equation (10)

$$q_t = \lambda_t = \frac{V_t}{(1-\delta)K_{t-1}} - \frac{R_t}{(1-\delta)}\frac{B_t}{K_{t-1}} - \frac{\theta_t}{K_{t-1}} \quad (3.10)$$

Equation (3.10) shows that an additive division of capital, λ_t, in relation to the shadow value is equal to marginal q_t. Where $\frac{\theta_t}{K_{t-1}}$ stands for the nearest possible infinite sum $\sum_{i=0}^{\infty} \rho^i (B_{t+i+1} + \mu_{t+i})$. The above term gets zero as the external financing's shadow price becomes zero.

By assuming quadratic adjustment costs,

$$C(I_t, K_t, \varepsilon) = \frac{b}{2}\left[\left(\frac{I_t}{K_t}\right) - g\left(\frac{I_{t-1}}{K_{t-1}}\right) - a + \varepsilon_t\right]^2 K_t \quad (3.11)$$

The investment equation is got by rewriting first order condition (3.6) and using adjustment costs' functional forms:

$$\frac{I_t}{K_t} = a - \frac{1}{b} + g\frac{I_{t-1}}{K_{t-1}} + \frac{1}{b(1-\delta)}Q_t - \frac{R_t}{b(1-\delta)}\frac{B_t}{K_{t-1}} - \frac{1}{b}\frac{\Theta_t}{K_{t-1}} \quad (3.12)$$

$\frac{1}{b}\frac{\Theta_t}{K_{t-1}}$ examines the effect of financial gaps on the investment behavior of firms. Baum *et al.* (2010) develops how much a firm faces financial friction, the role of function of the liquidity of firms, $\frac{CF_t}{K_{t-1}}$, the uncertainty measure and it's interaction to the measure of liquidity.

$$\frac{\Theta_t}{K_{t-1}} = c_1\eta_{i,t-1} + c_2\varepsilon_{t-1} + c_3\nu_{i,t-1} + \frac{CF_t}{K_{t-1}}(1 + a_1 + a_2\eta_{i,t-1} + a_3\varepsilon_{t-1} + a_4\nu_{i,t-1}) \quad (3.13)$$

By substituting the parameter of $\frac{\Theta_t}{K_{t-1}}$ we got eqauation (3.14)

$$\left(\frac{I_{i,t}}{K_{i,t-1}}\right) = \beta_0 + \beta_1\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right) + \beta_2 Q_{it} + \beta_3\left(\frac{CF_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{L_{i,t-1}}{K_{i,t-2}}\right) + \gamma_1\eta_{i,t-1} + \gamma_2\varepsilon_{t-1} + \gamma_3\vartheta_{i,t-1} + \left(\frac{CF_{i,t}}{K_{i,t-1}}\right)\times\left(w_1\eta_{i,t-1} + w_2\varepsilon_{t-1} + w_3\nu_{i,t-1}\right) + k_i + \epsilon_{it} \quad (3.14)$$

This is the standard investment model which captures the effect of different form of uncertainties.

where,

i Indexes of firm, $I_{i,t}$ is investment. Likewise, the firm's market value is denoted by Q_{it}, where the market value is the net financial assets divided by lagged capital stock's value. Moreover, $CF_{i,t}$ is cash flow, and L_i is firm's leverage, η_{t-1} is firm-specific uncertainty

ε_{t-1} is Market uncertainty, $\nu_{i,t-1}$ is correlation between firm and market uncertainty, k_i denotes firm fixed effect, ϵ_{it} shows error term.

These uncertainty factors, along with cash flow, impact investment behavior of firms in Pakistan. By including extrinsic and firm-specific uncertainty in this study, we are most likely to examine

how sensitive investment is to intrinsic, or the market uncertainty. The anticipations coming out of CAPM is measured with the help of the covariance term. The interaction terms will inspect mangers' attitude and investment decisions in the time of uncertainty.

The model discussed above has been used to elevate different uncertainty measures having direct and indirect impacts on investment. It is predicted that β_1, β_2 and β_3 are to be positive and β_4 to be negative by keeping in mind the earlier theoretical and empirical findings. The extent to which model estimation is concerned, 5 models are estimated in this study. The equation (3.14) is gauged at first place having only the firm-specific uncertainty measure and its interaction affect. Next, we estimate model for market based uncertainty. Afterward we check the effect of both uncertainty measure and their interaction effect with cash flow in a single model. In the 4rth model we incorporate all 3 measure of uncertainty along with interaction term. Finally, we check the effect of only interaction terms to capture the effect of spill over.

3.3.1 Spillover Effect of Uncertainty

A partial equilibrium model of precautionary demand for liquid assets is developed by Baum *et al.* (2008) to understand how idiosyncratic and macroeconomic uncertainty may affect firms' cash holdings. The practical findings show that on non-financial US firms' optimal liquidity there is a great impact of uncertainty and because of the expansion in idiosyncratic or macro uncertainty firms demand more liquid funds. Thus, it can be stated that a financing stagey of firms is largely dependent on the accessibility of internal finance and investment opportunities of firms, and uncertainty is probably going to have spillover impacts. This effect may have a direct impact on borrowing decisions of firm and indirect affect on cash holdings of firm. Derivatives of investment w.r.t firm-specific and extrinsic uncertainty are calculated through given below equations.

$$\partial I/\partial firm = \Psi\sigma firm + \Psi\sigma firmCash \times Cash \quad (3.15)$$

$$\partial I/\partial macro = \Psi\sigma macro + \Psi\sigma macroCash \times Cash \quad (3.16)$$

$\Psi\sigma firm$, $\Psi\sigma firmCash$ refer to the evaluated coefficients for the effects of firm-specific uncertainty and the association of cash with intrinsic uncertainty. In the same way, $\Psi\sigma macro$ and $\Psi\sigma macroCash$ indicate the coefficients related to market instability and the collaboration of market uncertainty with cash. Term cash indicates the specific level of cash and correspondent.

Evidence has been provided by Baum *et al.* (2010) that show the direct effect of uncertainty on firms' capital investments on the other hand indirect effect of uncertainty on liquid funds of firms. Uncertainty effects are observed to check if there are spillover effects onto firms' investment decisions because of the cash holding position of firms. Thus, the interaction term of cash flow-uncertainty is taken for fundamental specification of this study.

3.4 Description and Variables of the study

Various variables that we use in our model have already been used by empirical studies to check the association between investment and uncertainty. The description about particular variables and the rationale of their selection are discussed below.

3.4.1 Dependent Variable

I represent the investment expenditure that would be explained through Q_{it}, CF_{i,t,L_i}.

We construct investment as the proportion of investment with the lag estimation of the Total asset Rashid (2011).

$$\text{Investment } (I_{it}) = \frac{I_{i,t}}{K_{i,t-1}}$$

We defined investment as the purchase of fixed tangible assets, where (I) is the investment spending of ith firm in year t. Following the work of Bo (2007), we measured capital stock (K) by total assets in the balance sheet. It is noted that Bond and Cummins (2004) check relation between investment and uncertainty, and they also used the proportion of investment with respect to capital stock for measuring investment. Several other researchers like Baum *et al.* (2008, 2010) define investment as a proportion of investment with respect to the lag estimation of Total asset.

3.4.2 Independent Variable

Our model contains three basic variables, cash flow, Tobin's Q and leverage to describe investment behavior. It also includes three measures of uncertainty (intrinsic, extrinsic, and CAPM) in interaction with firms liquidity (CF) to find the magnitude of the sensitiveness of the investment decisions with respect to market or idiosyncratic uncertainty. Interaction term will explain mangers' attitude in the presence of different cash flow situations and the impact of their wary behavior on investment decisions of firms (Bloom *et al.*, 2007).

- **Tobin's Q**

According to Bond and Cumin (2004) tobin's Q is a present value of upcoming net cash distributions to shareholder in the begin of the period t to the starting period value of replacement cost. Average q is defined by Leahy and Whited (1996) and Baum *et al.* (2010) as a firm's market value net of the current assets to the firm's replacement value of capital stock. We construct Tobin's q as the firm's market value net of the current asset divided by lagged value of Total asset.

$$\text{Average } Q_{it} = \frac{D_{it}+E_{it}-INV_{it}}{K_{it-1}}$$

$D_{it} + E_{it} - INV_{it}$ denotes the market value capital stock at time t. Here inventory value is deducted from the firm's market value, because inventories are incorporated in the estimation of firm's market value however they don't add to the capital stock's market value.

- **Leverage**

Leverage is the utilization of different money related instruments or obtained capital, which is utilized to back company's assets. Highly leveraged firm is one that has liabilities greater than equity. Leverage is characterized as fraction of debt divided by capital stock's replacement value (Baum *et al.*, 2010). . Lit−1 is defined as the summation of total short-term and total long-term debt.

Leverage ratio $(L_{it}) = \frac{L_{i,t-1}}{K_{i,t-2}}$

Researchers like Marsh (1982), Rajan and Zingales (1995), Fama and French (2002), and Leary and Roberts (2005), characterized leverage as a fraction of the estimated book value of liabilities divided by total assets. Lagged value is used to analyze the effect that investment plans that have been made earlier before observing the level of uncertainty. Secondly lag term is used to check the effect of earlier investments on current position, because investment decision that firm make in past do have an effect on current period as well (Baum *et al.*,2010).

- **Cash Flow**

Cash flow is characterized as the total sum of cash and its correspondents that is being generated through business. Cash flow shows the current financial position. When the cash flow is positive, there is increase in the liquid asset of firms, which help firms in settling their liabilities, give back shareholders their money, pay costs, reinvest in its business and act as a shock absorber against future money related difficulties. Negative cash flow indicates that a company's liquid

assets are decreasing. Boyle and Guthrie (2003) find the impact of liquidity on the investment of firms. Increasing cash flow relaxes the limitations on current venture, as well as makes holding up less dangerous and in this manner expands the opportunity cost of present time period investment. Model that is used in this study also inspect the association share by uncertainty and investment. Even though the value of delaying investment expands in the time when value of project is uncertain and brings down the value of current investment, more uncertainty about firm's liquidity has the inverse effect: greater uncertainty about the firm's expected upcoming cash flow raises the danger of future financing shortages, along these lines bringing down the benefit of holding up investment and expanding current venture. The proxy we are using is cash flow to the lagged value of total asset. Many other researchers like Rashid (2010) and Baum *et al.* (2010) use same proxy for measuring cash flow ratio.

$$\text{Cash Flow Ratio } (CF_{it}) = \frac{CF_{it}}{K_{i,t-1}}$$

3.5 Uncertainties Measures

3.5.1 Generating Firm-Specific Uncertainty

Researchers implement a wide array of different methodologies to produce an appropriate idiosyncratic uncertainty proxy. As Huizinga (1993) obtains conditional variance from a GARCH-type specification on wage and materials cost and uses it. By using a geometric Brownian model, Caballero and Pindyck (1996) derived the variation of the marginal revenue product of capital Pindyck and Solimano (1993). Standard deviation of the firm's unpredictable profit is used by Ghosal and Loungani (2000) to measure the firm-level risk. Bo (2002), from an AR (1) model for sale, makes use of the cumulative variance of the errors, which he constructed, to measure uncertainty for each year. Bo and Lensink (2005) make use of the volatility of the number of employees and stock price volatility to measure firm-level uncertainty. They argue that the price volatility is the difference among the greatest and lowest stock price, which is standardized by the lowest price. They make use of the coefficient of variance to construct volatility based on employees, over a seven-year period. Variance of the fims' stock price is used to estimate idiosyncratic uncertainty as share by Baum, Talavera, and Stephan (2009).

Intrinsic uncertainty is understood as an owned uncertainty in this study, which is represented by the model developed through η Baum *et al.* (2010). The firm's stock returns drive this uncertainty. The concentration on uncertainty measures associated with company's domain is allowed by use of firm-specific daily return. An increase in investment is directed by an increase in the firm-level uncertainty, and with higher levels of liquidity the effect strengthens (Baum *et al.*, 2010). Also, Bond and Cummins (2004), Leahy and Whited (1996) calculate firm level uncertainty by using daily stock returns. Though, to produce a proxy for uncertainty both use different methodologies.

The daily stock return method is proposed by Merton (1980) to scrutinize the intrinsic uncertainty by observing intra annual fluctuations in stock returns. Some potential impediments like: 1) High shock persistence when moving average representations are used, and 2) With the application of ARCH/GARCH a low correlation in volatility to compute low frequency series in volatility; are avoided in this approach. The intra yearly instability from daily information needs to be calculated for Merton methodology. One needs to take the squared difference, by dividing the square root of the number of days intervening, of the daily changes in returns. Thus, the day by day commitment to yearly volatility is defined through it.

$$\varsigma_t{}^d = \left(100\frac{\Delta x_t}{\sqrt{\Delta \emptyset_t}}\right)^2$$

The calendar time impact is expressed by the denominator. $\Delta\emptyset_t$=1 would express if data was to be generated every calendar day. On the other hand, $\Delta\emptyset_t \in (1, 5)$ is given when the data is unavailable on weekends or due to holidays.

To define the expected yearly volatility of the series of return, the following equation is used:

$$\emptyset[x_t] = \sqrt{\sum_{t=1}^{T} \varsigma_t^d}$$

T shows yearly frequency in $\emptyset_{t[x_t]}$.

3.5.2 Generating Macro Uncertainty

As different methodologies have been used by researcher to produce an appropriate proxy for idiosyncratic uncertainty, similarly they generate measures for extrinsic uncertainty. Government consumption, exchange rate, and growth of nominal money is used by Aizenman and Marion (1999) to obtain conditional variances from them to use as a proxy for macroeconomic uncertainty. Similarly, variation in output that is obtained through GARCH model is used to generate macroeconomic proxy by Driver, Temple, and Urga (2005). Baum *et al.* (2009) constructed a proxy for macro-level uncertainty by deriving the standard deviation of the important macroeconomic indicators via fitting in an ARCH generalized model.

Antagonistic to the aforementioned researchers, Ghosal and Loungani (2000) use the Federal Fund Rate (FFR) and the moving standard deviation of energy prices to proxy for macroeconomic fluctuations. An overview construct strategy based with respect to the scattering of figures, which are gathered from company or bank administrators were utilized by Graham and Harvey (2001) as a proxy to measure macroeconomic uncertainty. Market returns of two years and profit growth of non-financial firms are used by Korajczyk and Levy (2003). Multitudes of other researchers, including Kaufmann *et al.* (2005) adopt the Merton methodology in their investigation to measure macroeconomic uncertainty.

The market uncertainty which is derived from Pakistan Stock Exchange returns is defined as extrinsic uncertainty. ε is used to denote extrinsic uncertainty in the model. As liquidity increases vigorously, higher level of market-based uncertainty ε reduces investment (Baum *et al.*, 2010). Merton (1980) proposed the market return index method to generate extrinsic uncertainty from intra yearly fluctuations in collective series of financial market.

Since the environment uncertainty effects time t actual investment, it is encouraged to use lag measure of uncertainty. Stock prices and profitability are such measures of uncertainty. So according to this statement, uncertainty which has been observed recently in an efficient market setting likely symbolizes the upcoming uncertainty over the investment.

The role of covariance is explored by craine (1988) in a version of capital asset pricing model. According to the CAPM the required rate of return on an investment should be positively related to that investment's risk, which, in turn, is measured by the covariance of its returns with market as a whole. It is necessary to obtain a measure of risk in order to evaluate the CAPM. To measure the risk of an individual firm we use the covariance of the firm's daily stock return with the market index return.

3.6 Estimation Technique

3.6.1 The GMM Estimator

Many of the studies in the field of economics and finance use panel data. For the estimation of panel data GMM is one of the reliable estimator, as it gives stable and authentic values of the coefficient of variables. GMM estimator is most widely used estimator among the researchers. It is developed by Arellano-Bover (1995). GMM is especially designed to apply in a situation where number of observations are larger than number of time periods (small T and large N). Moreover, linear relationship should be prevailing between variables when the dependent variable depends on lagged time period realizations. Furthermore, GMM estimator is used in the presence of hetroskidasity and autocorrelation inside the individual, but not across them. Last but not least this estimator is used, when independent variables are correlated with past realization of the residual or with the contemporaneous.

3.6.1.2 Types of GMM Estimator

GMM estimator is of two types. One that is developed by Allenaro and Bond called difference GMM and the other developed by Blundell-Bond (1998) called system GMM. Difference between these two estimators is that, all regressors are changed utilizing differences in Arellano-Bond estimator. Despite what might be expected, extra presumption is adjoined by Blundell-bond (1998) and according to that, variable is orthogonal to the primary instrument variable difference. In reality because of the addition of this extra assumption, efficiency of the estimator improves intensely.

3.6.1.3 Why the system GMM

There are many variables that are dynamic in nature, thereby, they depend on their past performance. Nature of the investment behavior of firms is dynamic, present year firm investment do effect by the preceding year investment. One of the main assumptions of OLS says that residual and regressors are not correlated with each other. Therefore, the use of OLs 2SLS in our model would yield unstable and unpredictable results, because of the correlation between error term and lag value of dependent variable

GMM give two ways to deal with the problem in hand. First, through difference GMM change all the data, to eliminate the fixed effect. Second way is for lag dependent variable use an instrument that is particularly correlated with lagged value of dependent variable and uncorrelated with error term. It is not obligatory to use instruments that are outside the data set, researchers rather can find instruments from within the dataset. Generally, I_{it-2} can be use for I_{it-1} that is the lag value of dependent variable but in case of already changed data, both I_{it-2} and alteration in I_{it-2} possibly be used for instrument because these instruments are correlated with the lag value of dependent variable, whereas they are not connected with the residual term.

Difference GMM would not give accurate results, at the point where dependent variable is close to random walk. Because future changes cannot be predicted basrd on past level data. Thus, for differenced variables, the using instatements in untransformed form would perform weaker. Therefore, in order to remove the dynamic panel bias and to be the estimators more efficient, Blundell-Bond (1998) transformed the instruments instead of transforming the regressors, so that the instruments would become exogenous to the fixed effects. In sum, the Arellano-Bond estimator, uses level instruments for transformed variables, while the Blundell-Bond (1998), uses

differenced instruments for level variables. Further, it is also worth mentioning, that past changes in fact may carry more information about current levels, as compared to the past levels for current changes. Moreover, it is not recommended to use deeper lags in GMM technique, as it may not reveal extra sufficient information, and using additional instruments will cause the problem of "many instruments" relative to the sample size, which will lead to the weakening of the power of over-identification test (Roodman, 2009).

It is the beauty of system GMM that time-invariant variables could also be incorporated in the model which is not possible in differenced GMM, as through differencing all the time invariant regressors and fixed effect is purged out from the model. The incorporation of time invariant regressor would not affect the coefficient estimates of the remaining regressors, as all the instruments are orthogonal to fixed effects and to time invariant regressors as well.

However, because of the presence of the autocorrelation in the disturbance term, it's not valid to use lags as instruments. Hence it is recommended to verify the reliability of autocorrelation and instruments. Sargan/Hansen test is the standard test used to check the existence of auto correlation. Moreover, there is another test built up by Arellano-Bond, which can be applicable to the residual in difference. In order to check the validity of instruments, we apply J test of Hansen (1982). To check the presence of second order autocorrelation in the errors, Arellano-Bond AR (2) test is used.

Chapter 4

Results and Interpretation

4.1 Introduction

The key objective of this thesis is to analyze the impact of idiosyncratic uncertainty, market uncertainty and their covariance on the capital investment decisions of firms in Pakistan. This study also assesses the effects of uncertainty on investment through cash flows. In order to examine the direct and indirect impact of several uncertainty measures on investment of firms extended Tobin's Q model have been used augmented by Baum *et al.* 2010. Merton 1980 method of intra yearly fluctuations in returns of stocks and market returns is used to calculate idiosyncratic and macro uncertainty. Interaction between market and firm's uncertainty is measured through covariance (CAPM based risk measure).To scrutinize the outcome and association among cash flow and uncertainties and capital investment of firms, approach that is developed by Arellano and Bond (1991) and Blundell and Bond (1998) called generalized method of moments (GMM) for panel data is used. To deal with the correlation between the lagged endogenous variable and time-invariant components of disturbance, this approach uses inner instruments. Q Measurement error and endogenity problems are the two basic problems needed to be addressed, while assessing investment model. Chances of association of Q with residual are high. Blundell *et al.* (1992) argue Q model performance enhanced in case Q act as an endogenous variable. The uncertainty measure, besides Q, is also generated with errors. Pagan (1984) proposes that to lessen error of measurement, use instrumental variables instead of inserting in to the model already produced measures of

uncertainty. Therefore, the measure of uncertainty and the instrument that is used for Q are required to be used. Since we are aware that the accuracy of the system GMM estimation depends upon the instrument's credibility and that is why we apply Hensen-Sargan J-statistic test. For instrumental validity the second condition is that, the error term should be independent of second order auto-correlation. Hence we apply AR (2) test develops be Arellano-Bond (1991) to examine the presence of autocorrelation.

The previous chapters narrate the empirical model, estimation methodology and dataset. However this chapter exhibits the empirical results. First the chapter reports summary statistics for full sample of firms, next the results from the investment models are presented. Models are augmented separately for different types of uncertainty.

4.1.1. Summary Statistics

The description statistics for the variables of model are shown in Table 4.1. This data description enables us to understand the economic meaning and implication of estimated parameters. Table 4.1 reports the standard deviation, mean, median, 25th percentile, and 75 percentile for the variables. These variables include the dependent variable investment. Cash flow, Tobin's, and debt ratio are explanatory variables and firm-specific η_t, market uncertainty ϵ_t, and $v_t$covariance are independent variables. Mean quantifies central tendency for variables in hand. Skewness essentially measures the relative size of the two tails. Kurtosis is a measure of the combined sizes of the two tails. It measures the amount of probability in the tails. The value is often compared to the kurtosis of the normal distribution, which is equal to 3.

Table 4.1 Descriptive statistics

	median	mean	skewness	Kurtoises
Investment	0.0298193	0.1836321	29.02295	969.4577
Tobin's Q	0.9681965	1.440852	27.91533	945.1229
Cashflow/k	0.078865	0.1215983	17.72323	489.9631
Debt/	0.6384034	0.7696988	34.35145	1313.011
η_t	0.5254159	0.6187041	16.57311	389.571
ϵ_t	1.420164	2.050553	0.5502351	2.062367
v_t	0.8423739	0 .9195285	-15.16427	498.7748

Notes: This table has provided result of summary statistics for the employed data in our analysis. First columns show median of variables. While column 2, 3 and 4 show mean, skweness and kurtoses of the variables. Investment rate is a dependent variable and it's the ratio of investment to the total asset. The debt and cash flow ratio are given as cash flow to the lagged value of the total asset and debt divided by total asset lag value. The expression η_t is used to measure firm-specific uncertainty, ϵ_t denotes measure of Market uncertainty and v_t denotes CAPM based risk measure.

The table 4.1 suggests that Investment may not be normally distributed. We observe that investment is positively skewed as shown by the statistics of skewness. In addition, the statistics of kurtoses for investment is much higher than critical value of 3, which is required for normal distribution. In sum, the skewness and kurtoses values suggest non-normality in the investment distribution. Furthermore, we observe that average value of the investment is 18% which indicates that firms on average spend 18% of their total asset on capital investment.

Mean value of the cash flow is 21% which indicates that that on normal firm don't confront any huge money related imperative in producing money. The statistics of skewness for cash flows

suggest that cash flow is positively skewed. In addition, the statistics of kurtoses for investment is much higher than critical value of 3, which is required for normal distribution. In sum, the skewness and kurtoses values suggest non-normality in the cash flows distribution. The average debt to lag capital proportion value over firms is 0.769 which indicates that on average firms altogether utilize debt in making capital structure. We also examined the non-normality of debt to capital ratio and find that it is characterized with non-normal leptokurtic and positively skewed debt to capital distribution.

η_t is the measure for firm-specific uncertainty obtained from firm-stock returns. We find that in Pakistan the firm-specific uncertainty is non-normal with high peaks and flat tails. The statistics of skewness for firm-specific uncertainty suggests that it is positively skewed. ϵ_t denotes market uncertainty measurethat is obtained and constructed from Pakistan stock exchange index returns. We observe that market uncertainty is positively skewed as shown by the statistics of skewness. In addition, the statistics of kurtoses for market uncertainty 2.05which is less than critical value of 3, which is required for normal distribution it suggest that the distribution of market uncertainty have light tailed and flatter peaks. v_t denotes covariance between firm-specific and market uncertainty. Table 4.1 suggests that covariance between firm-specific and market uncertainty is negatively skewed. Furthermore, kurtosis of the covariance is non-normal with high peaks and flat tails.

4.2 Association between Capital Investment and Uncertainty

In this section, the results are presented utilizing method presented by Arellano and Bond (1991). To eliminate unobserved heterogeneity all models are being used in first difference term. To check the specification of investment models and instruments' credibility we applied Hansen's (1982) J-test using two-step GMM estimator unbalanced panel data. Furthermore, for gauging the serial correlation of second order with error term, we apply serial correlation test i.e. AR (2)

The coefficient of cash flow is 0.041 that is positive and significant. It indicates that a firm's investment increases when cash flow increase. These results are incline with the study of Vogt (1994). The findings related to the relationship among idiosyncratic uncertainty and capital investment show a negative association of firm-specific uncertainty with investment. The result shows that 1% increase in uncertainty decreases 39% of capital investment across firms on average. In particular, we find that firms are expected to reduce their investment when they face higher firm-specific risk. Specifically, our results suggest that firms are prone to invest less when they face variations in their sales and cash flows. This negative effect on investment of firm-specific uncertainty makes sense as risky firms generally face difficulty in acquiring external funds, particularly debt financing, to finance their investment opportunities. Thus, they are likely to cut their investment expenditures. The finding are inclined with the study of Leahy and Whited (1996), where in the existence of Q, firm-specific uncertainty affect the decisions of capital investment of firm all alone as well as through interaction with cash flows. The positive coefficient of intrinsic uncertainty interaction with cash holdings is shown in Table 4.2. The coefficient is statistically significant for both main effect and indirect effect.

Table 4.2 Robust Difference GMM Estimates of the Investment

	(1)	(2)	(3)	(4)	(5)
Investment rate	0.353**	0.638***	0.847***	0.437***	0.325**
	(.021)	(0.075)	(0.013)	(0.046)	(0.013)
Tobins Q	0.008***	0.006***	0.010***	0.010***	0.056***
	(0.002)	(0.004)	(0.006)	(0.001)	(0.001)
Cf Ratio	0.041***	0.954 ***	0.286***	0.259	0.128***
	(0.013)	(0.019)	(0.104)	(0.0091)	(0.049)
Debt Ratio	-0.002***	-0.019	-0.002	-0.002	-0.001***
	(0.032)	(0.002)	(0.002)	(0.069)	(0.012)
$\eta_{i,t-1}$	-0.041***		-0.0067**	-0.073***	
	(0.002)		(0.0319)	(0.029)**	
CF ratio×$\eta_{i,t-1}$	0.391***		0.025**	(0.342)	0.042***
	(.0951)		0.026	(0.013)	(0.048)
ε_{t-1}		-0.099**	0.081***	0.070**	
		(0.070)	(0.0047)	(0.006)	
CF ratio×ε_{t-1}		0.021***	-0.089***	-0.074	-0.029***
		(0.056)	(0.033)	0.019	(0.053)
$v_{i,t-1}$				-0.020***	-0.011***
				0.039	(0.064)
CF ratio×Beta				0.080***	0.084***
				0.021	(0.002)
Constant	0.043***	0.038 **	0.020**	0.022 ***	0.053***
	(0.007)	(0.002)	(0.015)	(0.002)	(0.001)
J value	253.00	335.17	304.81	321.16	290.85
J pvalue	0.188	1.000	0.428	0.409	0.315
AR(2)	-1.13	-1.10	-1.21	-1.19	-1.17
AR(2) pvalue	0.259	0.272	0.225	0.232	0.243

***p <0.01, **p <0.05 *p < 0.10,

Notes: 5072 is the size of sample having annual based data of firms taken from 400 manufacturing companies. Investment divided by total asset lag value ids the investment rate. Likewise, debt ratio and cash ratio are derived in the same manner. The term $\eta_{i,t-1}$is used for measuring the firm-specific uncertainty, ε_{t-1} is used as a measure of mark based uncertainty where CAPM is used as a risk measure. J represents over identifying restriction test of Hansen (1982) test of over identifying restrictions, serial correlation in error term is checked through test of Arellano and Bond (1991).

The result infers when companies encounter intrinsic uncertainty, cash holdings expansion cause them to increase their investment. The negative affect of firm-specific uncertainty will reduce in the presence of cash flow. The coefficient of cash flow is 0.041 that is positive and significant. It indicates that a firm's investment increases when cash flow increase. These results are incline with the study of Vogt (1994). The findings related to the relationship among idiosyncratic uncertainty and capital investment show a negative association of firm-specific uncertainty with investment. The result shows that 1% increase in uncertainty decreases 39% of capital investment across firms on average. In particular, we find that firms are expected to reduce their investment when they face higher firm-specific risk. Specifically, our results suggest that firms are prone to invest less when they face variations in their sales and cash flows. This negative effect on investment of firm-specific uncertainty makes sense as risky firms generally face difficulty in acquiring external funds, particularly debt financing, to finance their investment opportunities. Thus, they are likely to cut their investment expenditures. The finding are incline with the study of Leahy and Whited (1996), where in the existence of Q, firm-specific uncertainty affect the decisions of capital investment of firm all alone as well as through interaction with cash flows. The positive coefficient of intrinsic uncertainty interaction with cash holdings is shown in Table 4.2. The coefficient is statistically significant for both main effect and indirect effect. The result infers when companies encounter intrinsic uncertainty, cash holdings expansion cause them to increase their investment. The negative affect of firm-specific uncertainty will reduce in the presence of cash flows.

In column 2 of Table 4.2 we estimated a standard investment model augmented with extrinsic uncertainty. Here we check the effect of market uncertainty and its cash flow interaction separately on firms' capital investment. The results of j statistics and AR (2) show that instruments used in model are independent of the residual and there is no serial auto correlation with the residual.

As we can see in column 2 that the coefficient of investment to the total asset ratio is positive and significant, implying noteworthy preserving impact in investment expenditure of firms. The finding is incline with the study of Rashid (2011). He also shows a positive significant relationship between investments. The coefficient of debt to the lagged asset proportion is significantly negative represent a negative association among borrowing of firm and investment. The findings are incline with the study of Yuan and Motohashi (2008) which show a negative relation between debt and capital investment.

The coefficient of cash flow indicates that firms' investment increases when cash flow increase. The findings are incline with the study of Vogt (1994) . The findings related to the relationship among extrinsic uncertainty and capital investment show a negative association of extrinsic uncertainty with investment. The result shows that 1% increase in uncertainty decreases 0.997% of capital investment across firm on average. The result proposes that essentially firms decrease investment spending when the market environment is uncertain. The result is consistent with findings of Baum *et al.* (2010) and Masayuki (2016). In the existence of Q, market uncertainty negatively effects the capital investment decisions of firms. Interaction of cash flow to the market uncertainty is positive and significant implying that negative affect of market uncertainty is weak for firms having cash flows. The non-negative coefficient value of the interaction term proposes that managers get motivation form expansion in cash holdings and thus expand investment of firms. In other words an expansion in market-based uncertainty leads the firms to expand their investment. This investment rate has a direct relationship to the cash flow changes.

In column 3 of Table 4.2 we estimated a standard investment model augmented with idiosyncratic and market uncertainty. Here we check the impact of market uncertainty and firm-specific uncertainty and their cash flow interdependence on firms' capital investment. The result of j

statistics and AR (2) shows that instruments used in model are independent of the residual and there is no serial auto correlation with the residual.

A significant non-negative value of investment to the total asset ratio can be seen in column 3. The coefficient of debt to the lagged asset proportion is significantly negative represent a negative association among borrowing of firm and investment. The coefficient of cash flow indicates that firms' investment increases when cash flow increases. These results are incline with the study of Yuan and Motohashi (2008) and, Fodio *et al.* (2013).

When extrinsic uncertainty and firm-specific uncertainty come in together in a model, extrinsic uncertainty has significant positive value of coefficient and idiosyncratic uncertainty has an offsetting indirect significant effect. This demonstrates extrinsic uncertainty has less noticeable effect as compare to firm-specific uncertainty. The results are incline with the study of Baum *et al.* 2008. The interaction effect of intrinsic uncertainty is positive and its shows that non- negative coefficient value of the interaction term proposes that managers get motivation form expansion in cash holdings and thus expand investment of firms when there is high microeconomic uncertainty.

To examine the effect of idiosyncratic uncertainty, market uncertainty and their covariance on capital investment we augmented model with the covariance term along with firm by including - specific and market uncertainty as an explanatory variables into the specification. To scrutinize the association between cash flows and investment we include the interaction terms between uncertainty and cash flows ratio. As one can observe from the result given in column four of Table 5.2, j statistics and AR (2) show that instruments used in model are independent of the residual and there is no serial auto correlation with the residual.

As we can see from column 4 that the value of investment is significantly positive, implying noteworthy preserving impact in investment expenditure of firms. The findings are incline with the study of Rashid (2011). He also finds a positive significant relationship among present and prior value of investment expenditure. The coefficients of cash flow and leverage ratio are similar to those of previous columns. The coefficient of the firm-specific uncertainty is negative and statistically significant on the other hand, significant positive value of its interaction with cash flow ratio signifying the negative effect of uncertainty is weak for cash flows to firm-specific uncertainty. The non-negative coefficient value of the interaction term proposes that managers get motivation form expansion in cash holdings and thus expand investment of firms when there is high intrinsic uncertainty. On the other hand market uncertainty has quite opposite result. The significant positive value of market uncertainty is similar to those presented by Baum *et al.* (2008). While its interaction term is significantly negative which shows that positive effect of market volatility is weak for cash flows to market uncertainty. In other words, as market uncertainty increases, firms' investment decreases irrespective of the cash flow level. A possible explanation of this behavior of firms is that when the economic conditions are uncertain, firms may prefer to have cash in their hands rather than investing it, as higher amounts of cash reserves provide a safeguard to firms against any future insolvency.

The coefficient of covariance term is negative and statistically significant, while the coefficient of its interaction with cash flows is positive and significant. Its implying that the negative effect of covariance is weak for cash flows to covariance interaction (is weak in presence of cash flows). The results are incline with the study of Baum *et al.* (2010).

Column 5 shows the result of model augmented with cash flow interactions and not capturing the main effect of firm-specific and market uncertainty. As we can see from Table 4.2 column 5 that

the coefficient of interaction term of firm-specific uncertainty with cash flows ratio is positive and statistically significant. It shows that expansion in uncertainty leads the firms to expand their investment. The investment has a direct relationship to the cash flow changes. Firms' investment increases as uncertainty increases, with the investment rate becoming more sensitive towards change in cash flow. While the coefficient of market uncertainty to cash flow ratio is negative and statistically significant. It indicates that as market based uncertainty increases capital investment decreases irrespective of cash flow level. This is indicating guarded managers' behavior. When we observe the effect of CAPM based uncertainty and its interaction term we got negative significant coefficient for CAPM main effect while interaction term has positive significant coefficient. It indicates the expansion in investment of firms as uncertainty increases, with the investment rate becoming more sensitive towards change in cash flow. Our findings are consistent with the study of Baum *et al.* (2010).

The implications of CAPM theory are supported by the final conclusion, and the results achieved are opposite to the results which were presented by Leahy and Whited (1996). The debt and the cash flow ratio perform significant parts in combination along with uncertainty, as is seen in the model presented in column five. In general, our findings suggest that fixed capital investment is particularly upset by uncertainty through cash flow, as the impacts vary in sign. Except for market (extrinsic) uncertainty, the overall sensitivity of cash flow to the investment is directly proportional to the increase in uncertainty. When extrinsic uncertainty increased, the impact of cash flow reduced as firm managers will fail to separate the good investment projects from the bad ones. Therefore, in uncertain environments, managers will be more unenthusiastic to trust projects with uncertain returns. In the country, such as Pakistan, where institutions are weak, financial and economic policies lack consistently, financial markets suffer from frictions, and there is absence

of investment-favoring environment, it is obvious that variations in macroeconomic indicators make firms reluctant in expanding their businesses. Extrinsic uncertainty acts as a controlling influence, when in the model both CAPM and extrinsic uncertainty are counted. It is possible that positive coefficient on market uncertainty serves for mangers as a real option to make investments which would provide their firm a better chance to grow its market shares.

Figure 4.1

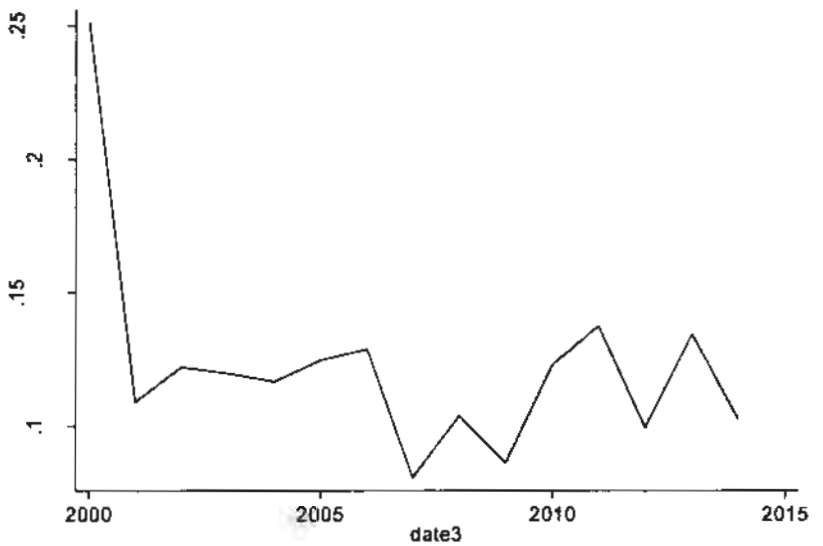

Figure 4.1 shows the cash flow pattern over the last 15 years. As one can see from the figure cash flows fluctuates between the range of 0.1 to 0.25. The firms' cash flow ratio drops from 0.25 to 0.03 in 2001. After that it increases gradually. Then again it drops to the minimum level in 2007. It may be because of the uncertain environment and political instability in Pakistan in 2007 and 2008. Benazir assassination and upcoming election created the uncertainty which caused instability in cash flows as well.

Figure 4.2

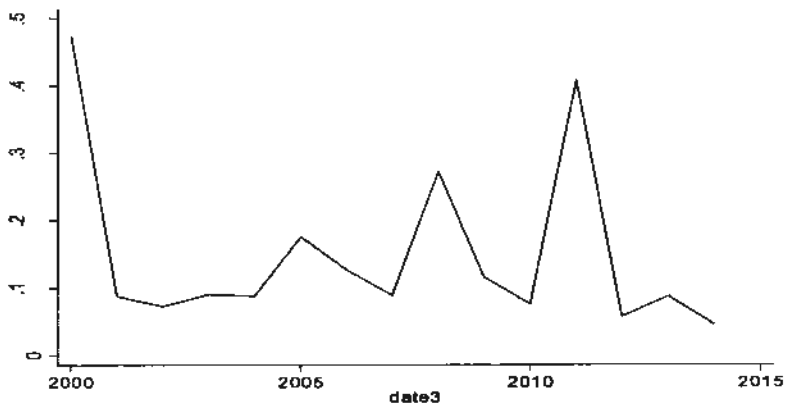

Figure 4.2 shows the investment pattern of firms over the last 15 years. Investment of firms decreases in 2001 and then it starts increasing gradually and it reaches to its peak after dropping in 2001 to .4 in 2012. As one can see that investment reaches to its minimum level in amid 2008 and 2007 it is because of the uncertainty in our markets. Both political uncertainty causes firms to drop their investment and that point cash flows of firms also drops.

4.3 The Effect of Cash Flow and Uncertainty

The effects of uncertainty, own and spillover have been established. The full extent of the effects of the aforementioned types can be calculated on uncertainty. The results indicate that the effects of uncertainty on investment is by no means trivial and it will vary across the different types of uncertainty. The results are incline with the study of Boyle and Guthrie (2003). The expansion in idiosyncratic uncertainty causes the firms to increment their investment, and with a more strengthened impact at a more elevated level of liquidity, is an interesting effect to note. With the effect of the interaction term, the negative impact of idiosyncratic uncertainty on investment can be reduced. The negative association between idiosyncratic uncertainty and investment decreases when the cash holdings of firm increases, indicated by these estimates.

There is a stronger association among macroeconomic uncertainty and investment. This proposes that when the economy is uncertain, firms which hold more cash are probably going to reduce investment by a larger amount when macroeconomic volatility increases. This conclusion is opposed to the one that was made for idiosyncratic uncertainty.

The firms' cash flow determines the effect of CAPM based uncertainty measure on investment. In the circumstance of low cash flow of a firm, a rise in the covariance between idiosyncratic and extrinsic uncertainty causes a slowdown in capital investment of firms. Nonetheless, the negative covariance effect vanishes when there is an increase in cash flows. Therefore, an expansion in cash holding of firms reduces the negative impact of CAPM based uncertainty on investment. According to one of the most prominent finding of the spillover effect, the firms with more cash holdings is more prone to increase investment by a larger amount when intrinsic uncertainty expands, compared to firms having lower cash holding levels. The same is applicable for CAPM-based measure. While, this observation, in the case of macroeconomic uncertainty is reversed.

We have calculated the investment elasticity in relation to cash flow through the equation given below.

$$\partial \text{Invest/ Cash flow} = \text{Cash flow} + \Psi\sigma\text{firmCash} + \Psi\sigma\text{mktCash} + \Psi\sigma\beta\text{Cash} \qquad (4.1)$$

In the equation 4.1, the estimated coefficients for the effects of interaction of idiosyncratic uncertainty with cash holdings is denoted by $\Psi\sigma$firmCash. Likewise, $\Psi\sigma$mktCash refers to the coefficients associated with the interaction of cash holdings with macroeconomic uncertainty. The coefficient which associates the interaction of CAPM based uncertainty with cash holding is represented by $\Psi\sigma\beta$Cash.

Table 4.3 presents the results of estimated investment elasticity relating to cash flows, as the value for every measure of uncertainty varies from low, median or high. Values above or equivalent to 75th percentile are the high values, while on the other hand values above or equal to 25th percentile are considered as low. The results presented in Table 4.3 shows the reaction of firms for each measure of uncertainty with respect to the cash flow on different levels.

Table 4.3 Investment elasticity w.r.t cash flow

Firm-specific	Extrinsic	CAPM	Elasticity	S.t Eπ
Low	Low	Low	0.096	0.004
Low	Low	High	0.097	0.004
Low	High	High	0.033	0.004
Low	Low	Low	0.033	0.004
Median	Median	Median	0.087 .	0.004
High	High	High	0.034	0.004
High	High	Low	0.033	0.004
High	Low	Low	0.096	0.004
High	Low	High	0.097	0. 004

Notes: High: uncertainty measure at or above 70 percentile Median: uncertainty measure at the 50 percentile Low: uncertainty measure at or below the 30 percentile.

The elasticity of investment regarding cash flow is laid out in Table 4.3. Since every uncertainty measure gets at high, median or low level, these values become more likely to be seen positive and significantly different than zero. It is notable that on different levels of uncertainty the effect of

cash flow is varied. For any given level of uncertainty, an impact of 100% expansion in cash flow on investment will be different ranging from 3.3% to 9.7%. For instance, a 100% cash flow expansion causes 3.4% increase investment at a level of uncertainty where all 3 uncertainties are taken as high i.e. 70%. Moreover, the largest impact is recorded when extrinsic uncertainty increases or reduces amid low and high level. It happens due to the negative effect of extrinsic uncertainty on firms' capital investment while not changing other variables. This study strongly indicates that the models that neglect to adequately consider the collaboration amongst cash holdings of firms and uncertainty are probably going to neglect to deliver precise outcomes about the association between investment and uncertainty. The cash flow plays an important role in changing the impact that uncertainty has on firms' investment. The findings that are included in this study, point towards the dependence of the effects of uncertainty, kinds of uncertainty and talks about the effect that cash holdings has on firm investment.

Chapter 5

Conclusion and Policy Implications

5.1 Background of the Thesis

A great amount of effort has been put in by researchers in order to investigate the linkages between uncertainty and firm level investment. Multiple sources of uncertainty like cost, sales, output, policy changes, interest rate and financing availability may influence capital investment decisions of firms.

Capital investment is a way through which firms expand their capital share. Profit that firms get in return for investing in capital asset is a source of motivation for future investment. Aim of firms while making investment in capital goods is to expand capacity of production and thus meet the consumers' market rising demand. Entering into the different industry and earning profit is also the reason of firms' investment.

Thus, it is very important to capture those variables that affect investment, especially the uncertainties that arise from different sources. Understanding the sources of uncertainty will help firms mitigating risk that arise due to uncertainties. Uncertainty can take many shapes. It can occur because of the fluctuation in wages, prices, output (in case of change in technology), economic policy Kang *et al.* (2014) or change in consumer taste (Bo, 2002). Intensity of the association between investment and uncertainty is probably different across firms contingent on their capital market accessibility (Goshal and Loungani, 2000). To analyze the effect of firm-specific and macro uncertainty and their covariance on external financing cost of firms, and ultimately on decisions of investment of manufacturing firms in Pakistan is the key objective of this study. This

study has just not assessed the association among uncertainty and investment, yet analyzes the influence of uncertainty on investment through firms' cash flow as well. As various researchers show, because of the variation in uncertainty with the passage of time, lenders become more cautious about firm's creditworthiness. In such circumstances, lenders would prefer to give loan on greater risk premium. Thereby, the study examines the association shared by cash flow and capital investment in presence of variation in uncertainty in case of Pakistan. Furthermore, this study intends to provide empirical evidence on the linkages among uncertainty, cash flow of firms and behavior of capital investment of Pakistani manufacturing firms. To examine the intrinsic and extrinsic uncertainty we use daily stock return and market index return method proposed by Merton (1980) who used intra yearly variation in share to calculate uncertainty measures.

5.2 Key Findings

Summarization of our key findings about uncertainty and investment relationship is as per the following. First, relationship among uncertainty and firms' investment decision is negative. Uncertainty upsets investment in capital asset where the presence of cash flow plays an important role with contrasting signs. On the whole, the sensitivity of cash flows in relation to investment is an increasing function of an uncertainty with the exception of market uncertainty. Cash flows affect decreases in the presence of increasing extrinsic uncertainty. In an unpredictable condition it is difficult to make good investment decisions for mangers. Henceforth managers will avoid investing in a project where returns are uncertain. We come to know that a rise in firm-specific uncertainty encourages investment, and rise in investment spending expands in presence of liquidity effect. There is a noteworthy association between interaction of firm-specific and market uncertainty and investment with different sign depends upon firms' level of cash flow. Extrinsic uncertainty acts as a subduing influence, when in the model both interaction of firm-specific and

market uncertainty and market uncertainty are counted. It is possible that positive coefficient on market uncertainty serves for mangers as a real option to make investments which would provide their firm a better chance to grow its market shares. This study strongly indicates that the models that neglect to adequately consider the collaboration amongst cash holdings of firms and uncertainty are probably going to neglect to deliver precise outcomes about the association between investment and uncertainty. The Findings included in this study, point towards the dependence of the effects of uncertainty on investment and how the cash holdings of a firm change over a period of time.

5.3 Policy Implications and Further Extensions

The policy makers are required to control and regulate the stock market fluctuations such that it should not negatively affect the health of the economy. Particularly the capital investment of firms since, a firm's rate and direction of growth is decisively influenced by its capital investment decisions.

The result of our study helps professional investors to modify their investment behavior and decisions. Our findings urge policy makers to adequately consider the investment uncertainty relationship while designing monitory and fiscal policies. Policy makers with the help of their policies can control and mitigate market level uncertainty. Our results suggest that cash flows has a vital role in the capital investment decisions of firms, hence, the policy makers must take in to account the cash flow while making policies. Since the presence of cash flow can reduce the negative effect of market and firm-specific uncertainty on investment. The analysis also suggests that macroeconomic uncertainty has a relatively stronger negative impact than firm-specific risk on firms' investment decisions. The finding that firms cut their investment spending in times of

macroeconomic instability implies that declines in firms' investment spending during periods of macroeconomic turmoil may delay the process of recovery. Therefore, the policy makers should design such policies that encourage firms to invest more in economic crisis periods, which, in turn, would enhance the growth of the economy and help to overcome the problem of downturn/recession.

This research can be extended for future research in several directions. We examine the effects of uncertainty on capital investment for listed manufacturing firms. However, one can conduct this study on private firms. Their analysis may provide an interesting comparison of the effects of uncertainty on investment across privately and publically listed firms. Furthermore, our study and results about relationship among firm investment behavior and cash flow have made it possible to further explore along these lines with special reference to firm's heterogeneity. It will reinforce the effect of relationship between certainty and firms' liquidity. This should be done while interrogating the role played by financial friction on the firm's capital investment behavior.

References

Abel, A., & Eberly, J. (1999). The Effects of Irreversibility and Uncertainty on Capital Accumulation. *Journal of Monetary Economics, 44*(3), 339-377.

Ağca, Ş., & Mozumdar, A. (2008). The Impact of Capital Market Imperfections on Investment–Cash Flow Sensitivity. *Journal of Banking & Finance, 32*(2), 207-216.

Antonakakis, N., Chatziantoniou, I., & Filis, G. (2013). Dynamic Co-movements of Stock Market Returns, Implied Volatility and Policy Uncertainty. *Economics Letters, 120*(1), 87-92.

Appelbaum, E., & Katz, E. (1986). Transfer Seeking and Avoidance: On the Full Social Costs of Rent Seeking. *Public Choice, 48*(2), 175-181

Almeida, H., Campello, M., and Weisbach, M. (2004) The cash flow sensitivity of cash, *Journal of Finance,* 59, 1777-804.

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies, 58*(2), 277-297.

Azmat, Q.-u.-a. (2014). Firm value and optimal cash level: Evidence from Pakistan. *International Journal of Emerging Markets, 9*(4), 488-504.

Baker, N. L., & Haugen, R. A. (2012). Low Risk Stocks Outperform within all Observable Markets of the World. *SSRN 2055431*, 234-249.

Baum, C. F., Caglayan, M., & Talavera, O. (2008). Uncertainty Determinants of Firm Investment. *Economics Letters, 98*(3), 282-287.

Baum, C. F., Caglayan, M., & Talavera, O. (2010). On the Investment Sensitivity of Debt Under Uncertainty. *Economics Letters, 106*(1), 25-27.

Bertola, G. (1988). *Adjustment costs and dynamic factor demands: investment and employment under uncertainty* (Doctoral dissertation, Massachusetts Institute of Technology).

Bloom, N. (2009). The Impact of Uncertainty Shocks. *Econometrica, 77*(3), 623-685.

Bloom, N., Bond, S., & Van Reenen, J. (2007). Uncertainty and Investment Dynamics. *The review of economic studies, 74*(2), 391-415.

Blundell, R., & Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of econometrics, 87*(1), 115-143.

Bo, H. (2002). Idiosyncratic uncertainty and firm investment. *Australian Economic Papers, 41*(1), 1-14.

Bond, S. R., & Cummins, J. G. (2004). Uncertainty and Investment: An Empirical Investigation Using Data on Analysts' Profits Forecasts.

Boyle, G. W., & Guthrie, G. A. (2003). Investment, Uncertainty, and Liquidity. *The Journal of Finance, 58*(5), 2143-2166.

Brainard, W. C., & Tobin, J. (1968). Pitfalls in financial model building. *The American Economic Review, 58*(2), 99-122.

Byun, S., & Jo, S. (2015). Heterogeneity in the Dynamic Effects of Uncertainty on Investment (pp. 15-34).

Caglayan, M., & Rashid, A. (2010). The response of firms' leverage to uncertainty: Evidence from UK public versus non-public firms.

Chris Foster, & Green, K. (2000). Greening the Innovation Process. *Business Strategy and the Environment, 9*(5), 287–303

Cummins, J.G., Hassett, KA., and Oliner, S.D. (2006) Investment behavior, observable expectations, and internal funds, *American Economic Review,* 96, 796-810.

Dixit, A. K., & Pindyck, R. S. (1994). *Investment under uncertainty*. Princeton university press.

Driver, C. and Moreton, D. (1991) The influence of uncertainty on aggregate spending, *Economic Journal*, 101, 1452-9.

Eberly, A. B. A. J. C. (2011). How q and cash flow affect investment without frictions: An analytic explanation. *The Review of Economic Studies, 78(4),* 1179-1200.

Engle, R. (2002). Dynamic Conditional Correlation: A Simple Class of Multivariate Generalized Autoregressive Conditional Heteroskedasticity Models. *Journal of Business & Economic Statistics, 20*(3), 339-350.

Fisher, I. (1930). The Theory of Interest. *New York, 43*, 147-163.

Fodio, M. I., Onah, R. I., & Oba, V. C. (2013). Impact of Cash Flow on Investment levels in Quoted Nigerian Manufacturing Firms. *Research Journal of Finance and Accounting, 4*(12), 16-22.

Froot, K. A., Scharfstein, D. S., & Stein, J. C. (1993). Risk management: Coordinating corporate investment and financing policies. *the Journal of Finance*, *48*(5), 1629-1658.

Fuss, C., & Vermeulen, P. (2004). *Firms' Investment Decision in Response to Demand and Price Uncertainty*. European Central Bank.

Ghosal, V. and Loungani, P. (1996) Product market competition and the impact of price uncertainty on investment: Some evidence from US manufacturing industries, *Journal of Industrial Economics,* 44, 217-28.

Goldberg, L.S. (1993) Exchange rates and investment in United States industry, *Review of Economics and Statistics,* 75, 575-89.

Guiso, L. and Parigi, G. (1999) Investment and demand uncertainty, *Quarterly Journal of Economics,* 114, 185-227

Gul, F. (1991). A Theory of Disappointment Aversion. *Econometrica, 59*(3), 667-686.

Hartman, R. (1972) The effects of price and cost uncertainty on investment, *Journal of Economic Theory,* 5, 258-66.

Hayashi, F. (1982). Tobin's Marginal q and Average q: A Neoclassical Interpretation. *Econometrico: Journal of the Econometric Society, 50*(1), 213-224.

Hennessy, C.A. and Whited, T.M. (2007) How costly is external financing? Evidence from a structural estimation, *Journal of Finance,* 62, 1705-45.

Hubbard, R.G., Kashyap, A.K., and Whited, T.M. (1995) Internal finance and firm investment, *Journal of Money Credit and Banking*, 27, 683-701

Huizinga, J. (1993) Inflation uncertainty, relative price uncertainty and investment in US manufacturing, *Journal of Money, Credit and Banking*, 25, 521-54..

Hum, A. and Wright, R.E. (1994) Geology or economics? Testing models of irreversible investment using North Sea oil data, *Economic Journal*, 104, 363-71.

Kang, W., Lee, K., & Ratti, R. A. (2014). Economic Policy Uncertainty and Firm-level Investment. *Journal of Macroeconomics, 39*, 42-53.

Kaplan, S.N. and Zingales, L. (2000) Investment-cash flow sensitivities are not valid measures of financing constraints, *The Quarterly Journal of Economics,* 115, 707-12

Kim, C.-S., Mauer, D. C., & Sherman, A. E. (1998). The Determinants of Corporate Liquidity: Theory and Evidence. *The Journal of Financial and Quantitative Analysis, 33*(3), 335-359.

Klock, M., Thies, C.F., and Baum, C.F. (1991) Tobin's q and measurement error: caveat investigator, *Journal of Economics and Business,* 43, 241-52

Leahy, J. V., & Whited, T. M. (1995). The Effect of Uncertainty on Investment: Some Stylized Facts: National Bureau of Economic Research.

Love, I. (2003) Financial development and financing constraints: international evidence from the structural investment model, *Review of Financial Studies,* 16, 765-91

Masayuki, M. (2016). Business Uncertainty and Investment: Evidence from Japanese companies. *The Research Institute of Economy, Trade and Industry.*

Merton, R. C. (1980). On Estimating the Expected Return on the Market: An Exploratory Investigation. *Journal of Financial Economics, 8*(4), 323-361.

Milos Markovic, M. S. (2017). Firm Growth Dynamics and Financial Constraints: Evidence from Serbian Firms.

Minton, B. A., & Schrand, C. (1999). The Impact of Cash Flow Volatility on Discretionary Investment and the Costs of Debt and Equity Financing. *Journal of Financial Economics, 54*(3), 423-460.

Myers, S. C., & Majluf, N. S. (1984). Corporate Financing and Investment Decisions When Firms Have InformationThat Investors Do Not Have. *Journal of Financial Economics, 13*, 187-221.

Nickell, S., & Metcalf, D. (1978). Monopolistic Industries and Monopoly Profits or, Are Kellogg's Cornflakes Overpriced? *Economic Journal, 88*(350), 254-268.

Oliner, S. D., & Rudebusch, G. D. (1996). Monetary policy and credit conditions: evidence from the composition of external finance: comment.*The American Economic Review, 86*(1), 300-309.

Panousi, V., & Papanikolaou, D. (2012). Investment, idiosyncratic risk, and ownership. *The Journal of Finance, 67*(3), 1113-1148.

Pagan, A. (1984). Econometric issues in the analysis of regressions with generated regressors. *Internationol Economic Review*, 221-247.

Pagan, A., & Ullah, A. (1988). The Econometric analysis of models with risk terms. *Journal of Applied Econometrics, 3*(2), 87-105.

Pastor, L. (2012). Uncertainty about Government Policy and Stock Prices. *The Journal of Finance, 67(4),* 1219-1264.

Peeters, M. (2001). Does Demand and Price Uncertainty affect Belgian and Spanish corporate investment? *Recherches Économiques de Louvain/Louvain Economic Review, 67(03)*, 235-255.

Rashid, A. (2011). How Does Private Firms' Investment Respond to Uncertainty? Some Evidence from the United Kingdom. *The Journal of Risk Finance, 12*(4), 339-347.

Roodman, D. (2015). xtabond2: Stata module to extend xtabond dynamic panel data estimator. *Statistical Software Components.*

Schiantarelli, F. (1996). Financial constraints and Investment: methodological issues and international evidence. *Oxford Review of Economic Policy, 12*(2), 70-89.

Simon Gilchrist, J. W. S., Egon Zakrajšek. (2014). Uncertainty, Financial frictions, and Investment dynamics *National Bureau of Economic Research*(No. w20038).

Vogt, S. C. (1994). The Cash Flow/investment Relationship: Evidence from U.S. Manufacturing Firms. *Financial Management, 23*(2).

Von Kalckreuth, U. (2000). Exploring the Role of Uncertainty For Corporate Investment Decisions in Germany. *Deutsche Bundesbank, Economic Research Centre, Discussion Paper*(5/00), 16-25.