Financial Constraints and Corporate Cash Holdings:

An Empirical Analysis using Firm Level Data

Submitted by

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Dedication

This humble effort is dedicated to my beloved parents

Ashfaq Ahmad

&

Rehana Ashfaq

for their love, endless support, and encouragement

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The expedition of compiling this dissertation was not only exhilarating, enlightening, and inspiring for me but also very challenging and exhausting. Apparently, along the course of pins and needles, many people provided guidance to arrive me at the finishing point.

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Abstract

In this dissertation, we scrutinize three different but interrelated issues regarding publicly listed manufacturing firms' cash-holding policy in Pakistan. First, we investigate whether the sensitivity of cash to its firm-specific determinants differs across financially constrained and unconstrained firms. We sort out firm-year observations as financially constrained and unconstrained based on the median value of three alternative financial constraints measures: the firm size, dividend payout ratio, and Whited and Wu (WW) index.

Second, we explore the role of growth opportunities in the cash holding decisions of firms. To do this, we stratify firms into high-growth and low-growth clusters based on the median of the market to book value (Tobin's Q). Finally, we aimed at studying whether firms those do more investment determine their cash balances differently than those firms that have passive investment policies. We identify low-investment and high-investment firms in a given year based on the median value of their net investment in the year. In order to mitigate the problem of endogeneity and to take into account the dynamic nature of the panel dataset, we utilize the robust two-step system-GMM estimator. We use unbalanced annual panel dataset covering the period 2000-2012.

Our results suggest that financially constrained firms decrease their cash holdings with size, leverage, and the payout ratio, while they increase their cash amounts with both the market to book value and the cash flow volatility. On the other hand, for financially unconstrained firms, we find that there is a positive relationship between cash holdings and firm size, the payout ratio, and the market to book value, while both the cash flow volatility and leverage are negatively related to cash holdings. These asymmetries in the sensitivity of cash to its determinants are robust across all the three financial constraints measures used in the study.

The results regarding the role of growth potentials in cash determinants reveal that the cash holdings of high-growth firms are positively affected by the cash flow volatility, size, the payout ratio, and Tobin's Q, whereas, they are negatively affected by cash flows and leverage. However, the cash holdings of low-growth firms are positively related to cash flows and the cash flow volatility, size, leverage, and the payout ratio, whereas, they are negatively related to only Tobin's Q.

Finally, we find that firms having active investment policy increase their cash levels with cash flows, size, the payout ratio, and Tobin's Q. However, they deplete their cash levels with cash flows volatility and leverage. For firms those have passive investment policy, we observe that they reduce their cash amounts with cash flows and leverage. We also observe that firms that do more investment are likely to hold less cash than the firms that do relatively low investment.

All in all, our findings suggest that the trade-off theory, the pecking order theory, and the agency theory are playing an important role in determining cash holdings of Pakistani corporations. The findings of the analysis are of great significance for investors, firm managers, and policymakers. In particular, our findings suggest that there is a need to reduce the financial market imperfections and take some steps to built inter-linkages between financial intermediaries and corporate firms. So that, firms can easily approach to external financing whenever they need funds to finance their investment and other operational needs. Thus, firms may use cash reserves for productive purposes rather than keeping in hand for providing buffer against any future insolvency.

JEL Classification: G30; G31; G32; G34; G35

Keywords: Cash holdings; Financial constraints, Firm characteristics, Growth potentials; Investment levels; Asymmetric effects; Panel data; System-GMM estimator; Corporate firms; Firm market value; The cash flow volatility;

Chapter 1

Introduction

1.1 Preface and Motivation

After the seminal work by Miller and Orr (1966), the cash holding behavior of corporate firms has captured intense attention in the finance literature.[1] Why do corporations accumulate the large amounts of cash balances?[2] Is there any optimal (target) level of cash holdings? Do firms having different characteristics hold different amounts of cash? These basic questions have recently attracted the interests of academics and researchers. Numerous theoretical and empirical studies have helped to delineate a clear image of the cash holding decisions of firms. For instance, Subramanian et al. (2011) and Schwetzler and Reimund (2004) suggested that cash holding is an important asset on balance sheet of firms and performs a significant role in firms' financial management. However, Opler et al. (1999) have documented that corporations use their cash reserves to finance their operating losses.

In explaining the incentives and costs related to cash holdings, researchers have been offered various explanations for why and when corporate firms mount up cash balances. Different researchers have identified different costs of holding excessive cash

[1]Several recent studies including Opler et al. (1999), Dittmar et al. (2003), Almeida et al. (2004), Ozkan and Ozkan (2004), Foley et al. (2007), Harford et al. (2008), Bates et al. (2009), Km et al. (2011), Duchin (2010), Anjum and Malik (2013), and Uyar and Kuzey (2014) have attempted to empirically examine the firm-specific determinants of cash holding decisions of corporate firms. Earlier studies, such as Baumol (1952), Miller and Orr (1966), and Jenson (1986), have emphasized to provide theoretical justification of firms' cash holding.

[2]Following prior studies including Duchin (2010) and Gill and Shah (2012), we define cash holdings of firms are as cash in hand and the short-term investments.

and benefits that the firms obtain by holding more cash. In particular, these benefits include a decline in the probability of financial distress (John (1993)), permitting the execution of investment projects in the presence of financial constraints (Kim et al. (1998), Opler et al. (1999), and Denis and Sibilkov (2010)), reducing transaction costs (Keynes (1936), and avoiding frequent external financing. On the other hand, the costs of excessive cash holding include tax disadvantages due to double taxation (Opler et al. (1999) and Foley et al. (2007), agency costs associated with free cash flow (Jensen (1986), Dittmar et al. (2003), and Harford et al. (2008)), lower return on liquid assets due to liquidity premiums (Opler et al. (1999) and Duchin (2010)), opportunity cost by pass up of valuable investments (Uyar and Kuzey (2014)).[3]Agency cost is considered one of the potential costs of firms' cash holdings. In this aspect, it is generally argued that if firm managers have more cash flows, they are likely to use them for their personal interest rather than investing for value maximization of their firms.

In principle, corporations hold cash for different reasons. Several years ago, Keynes (1936) proposed the transaction motive of cash holdings. Specifically, he explains that firms hold cash for day-to-day transactions. Recently, Besley and Brigham (2005) also pointed out that firms hold cash to make payments for goods and services. According to Pinkowitz et al. (2004), the precautionary motive of holding cash provides protection against future possible adverse shocks in case of costly external financing. Foley et al. (2007) explained that multinational firms hold cash for tax motives. Firms also hold cash in their hands because of agency motives.

[3]Cost of corporate image and cash discount loss on purchases are also considered as costs of excess cash holdings (see, for details, Adetifa (2005)).

As explained in Jensen and Meckling (1976) contradictory interests between shareholders and debtors due to asymmetric information increase the cost of new equities and cause firms to build up their cash balances. Yet, according to the pecking order model, corporations prefer internal funds to external financing for investment purpose (Myers and Maljuf (1984)). Thus, they are less likely to hold cash in their hands. Similarly, the free cash flow theory of Jensen (1986) explains that firm managers gain benefits of holding more liquid assets in order to increase their control on more assets. Mangers do so to have possible control upon the investment decisions. If they have more cash reserves, then, even without raising funds from external resources, they can carry out the investment projects that may even have a negative NPV and adversely affect the wealth of shareholders.

Broadly speaking, the pervious existing empirical literature on firms' cash-holding decisions can be classified in two related categories. The first strand of research explores the empirical determinants of the cash holding decisions of corporate firms. Along these lines, large number of studies including Kim et al. (1998), Opler et al. (1999), Ozkan and Ozkan (2004), Mahrt-Smith and Dittmar (2007),Guney et al. (2007), Bates et al. (2009), Harford et al. (2008), Huang et al. (2013), and Uyar and Kuzey (2014) have investigated the firm-specific factors that significantly affect cash holdings of firms. In particular, these studies have documented that cash flows of firms, cash flow volatility, firm investment expenditures, dividend, agency costs, firm size, firm leverage, and firms' growth opportunities are important in explaining firms' cash holding decisions.

The second strand of literature includes the studies (e.g., Chang et al. (2014), Chan et al. (2013), Martínez-Sola and García-Teruel (2013), Denis and Sibilkove (2010), and

Saddour (2006)) that have provided anticipation on firm cash holdings and attempted to seek the answer of the fundamental question 'what are the motives behind holding cash reserves of corporate firms'. Further, these studies prominently measure cash holdings implications for firm performance and valuation. Doing this, these studies provide important evidence on the real effects of cash reserves. More specifically, cash reserves are mainly found to bestow positively to enlarge value of corporation when corporations have important "growth opportunities" but partial access to external capital. Some studies have also documented that the consequences of cash holdings on valuation of firms are considerably higher when the firms are facing unsure regarding "investment opportunities" or face binding "financial constraints".[4]

1.2 Gap in Literature

Prior studies that relate firm-specific factors to cash holdings of firms left a considerable vacuum in the literature. Both theorists and empirics have mainly emphasized on the cash structure of corporation in developed countries and pay a little attention on the firms operating in developing countries.[5] It is well established that firms are more expected to obtain external financing at low cost and easily in well-developed and well functioning financial markets. Further, in developed countries, financial markets suffer from less market imperfections. Thus, firms are expected to opt for uses of external capital when financing their capital needs.

[4] The previous studies that have explored the cash holding structure of firms in this spirit are, among many others, Opler et al. (1999), Acharya et al. (2007), Han and Qiu (2007), Duchin (2010), Denis and Sibilkov (2010), Tong (2011), and Bigelli and Sanchez-Vidal (2012).

[5] The countries on which the studies have focused are, among others, the USA (Kim et al. (1998), Opler (1999), Harford et al. (2008), and Gao et al. (2013)), the United Kingdom (Ozkan and Ozkan (2004), and Al-Najjar and Belghitar (2011)), Japan (Pinkowitz and Williamson (2001), Kim et al. (2011)), Switzerland (Drobetz and Grüninger (2007), Turkey (Uyar and Kuzey (2014)), Spain (García-Teruel and Martínez-Solano (2008)), and Italy (Bigelli and Sánchez-Vidal (2012)).

However, the structure of financial markets, in developed countries is significantly different from the developing countries. In particular, the financial markets in developing countries are not friction less. Thus, the markets may suffer relatively more from asymmetric information problems.[6] Further, corporate firms and financial intermediaries are not well connected with each other. Consequently, obtaining funds from outside is expensive for firms in countries with less developed financial markets. Thus, firms face more hurdles and pay higher premium for acquiring funds from external capital markets (Arslan et al. (2006)). Therefore, we can say that firms operating in developing economies face relatively more severe financial constraints.

In this context, it would be informative and useful to investigate when, why, and how much firms hold cash in their reserve in developing countries. Although there is growing interest on examining the role of financial constraints on firms' cash structure, there is very limited research on this issue for developing countries. Yet, one can presume more pronounced influences of financial constraints on firms' cash-holding policies in developing countries.

1.3 Research Objectives

The primary objective of the study is twofold. First, we aim to explore the influence of financial constraints on corporate companies' cash-holding decisions. Second, the study also aimed at examining the role of growth opportunities of firms and their investment levels in their cash-holding decisions. Specifically, the study has the following objectives:

[6] Studies like Deloof (2003), Fisman and Love (2003), and La Porta et al. (1997) have shown that financial markets in developing countries suffer more financial constraints as compared to their developed countries.

- To investigate whether the sensitivity of cash to its determinants differs for financially constrained firms *versus* financially unconstrained firms.
- To explore the role of growth opportunities in the cash holding decisions of firms.
- To quantify the asymmetric effects of cash determinants on cash balances across high-investment firms *versus* low-investment firms.

1.4 Research Questions

In this study, we emphasize to answer the following research questions.

- When and why do corporate firms hoard large amounts of cash?
- What firm-specific factors influence firms' cash-holding decisions in Pakistan?
- Do financially constrained firms keep different amounts of cash as compared to their financially unconstrained counterparts?
- Whether high-growth firms and low-growth firms determine their cash stock differently?
- Does the level of firm investment matter for cash holding decisions of corporate firms?

1.5 Contribution of the Study

In this study, we extend the empirical literature of cash holdings behavior in several ways. First, we examine the cash holding behavior of firms that face financial constraints *versus* the firms that do not face such constraints. There are some previous studies that have also examined the role of financial constraints for cash holding decisions of firms. However, as we mention earlier, the focus of these studies was on developed countries (Chan et al. (2013), Denis and Sibilkov (2010), Han and Qiu (2007), and Almedia et al. (2004)). Unlike of these studies, we study the influence of financial constraints on the cash holding decisions of corporate firms operating in a relatively developing country, namely, Pakistan. Doing so, we complement and extend the existing literature on corporate cash holdings. Following previous studies, such as Duchin (2010) and Almeida (2004), we use three alternative methods to sort out financially constrained and unconstrained firms. These three methods are (1) firm size, (2) dividend payout ratio, and (3) Whited and Wu index, which is suggested by Whited and Wu (2006).

Consistence with the view that cash reserves ease off financial constraints, Faulkender and Wang (2006) found that the relationship between surplus returns and changes in cash holdings is relatively stronger for corporations that are more likely to be liquidity constrained. Moreover, Almedia et al. (2004) investigated the relationship between financial constraints and firms' cash holding decisions. They predicted that the cash flow-sensitivity of cash is stronger for firms that are financially constrained than financially unconstrained firms. Their empirical findings support their hypothesis. Similarly, Acharya et al. (2007) also examined the influence on cash holdings of firms of debt regarding financial constraints. They provide evidence that firms that face financial

constraints are likely to keep excessive amounts of cash but have lower use of debt tin their capital structure. They also show that hedging is an important motive for corporate cash holdings.

We also contribute to the existing empirical literature by studying the role of the potential growth opportunities of firms in the determinants of cash holdings. We sort out firms into high-growth and low-growth clusters according to their market to book value (Tobin's Q). Guney et al. (2007) documented that growth opportunities of firms are significantly related to their cash holdings. This is because, for firms those have more growth opportunities, external financing is more expensive. Therefore, firms with larger growth opportunities are likely to hold more cash reserves to overcome the problem of expensive external financing. Given this context, it would be useful to study the cash holding decisions of high-growth *versus* low-growth firms.

Finally, we take into account the role of firms' investment expenditures in firms' cash holding decisions. In this respect, we examine the differential response of cash holdings of high-investment and low-investment. We do so because some prior empirical studies, such as Denis and Sibilkov (2010) and Ogundipe et al. (2012) have examined the association between firms' investment and their cash holdings. They found a statistically significant effect of firms' investment policy on the firms' cash-holding policy. We use net investment of firms in order to classify them into high-investment and low-investment categories.

1.6 Significance of the Study

The investigation of the cash holding decisions of firms with different characteristics will be useful in enhancing our understanding of why firms hold cash reserves. Furthermore, this research would help fill the gap between research and practice as no research has so for been done in Pakistan to examine the relationship of cash holdings behavior of firms across high-growth and low-growth firms as well as across high and low investment firms. Yet, examination of this provides significant insight for investors. This study would also help to enhance our understanding of why financially constrained firms hold different amount of cash in their hands as compared to financially unconstrained firms. Furthermore, this study would be beneficial for the policy makers, financial managers, financial management consultants, and investor in designing effective polices to maximize their benefits.

1.7 Thesis Outline

This dissertation is structured into five chapters. Chapter 1 gives the backgrounds, objectives of the thesis, and research questions that we try to answer in this study. Gaps in the existing empirical literature on firms' cash structures are also presented in this chapter. The chapter also describes the contribution of this thesis into the literature. Finally, this chapter presents the outlines for the thesis.

Chapter 2 reviews the theoretical and empirical studies related to the cash holding behavior of firms. Specifically, this chapter describes the different economic and finance theories that explain why and when corporate companies build their cash reserves. The chapter also explains why financially constrained and unconstrained firms respond

differently to firm-specific variables when making cash holding decisions. This chapter also gives a detail review of the empirical findings of previous studies that have related the various firm characteristics to cash accumulation. These factors are cash flows, the cash flow volatility, dividend payment, the size of firm, firm leverage, and the market to book value of firms. At last, this chapter presents the review of the studies that have examined the cash structure of Pakistani firms.

Chapter 3 of the thesis outlines the empirical framework, which we implement in this thesis to investigate the impact of cash determinants of the cash holdings of firms. In particular, this chapter first describes our baseline regression of cash holding. The chapter next presents our augmented model that we apply to see the differential impacts of determinants of cash holdings. Chapter 3 also discusses the classification schemes used to split the firms into financially constrained and unconstrained clusters. Estimation methods, data, and variables construction are also given in this chapter.

The next chapter, Chapter 4, displays the empirical results. Specifically, this chapter first reports summary statistics and correlation matrix for full sample as well as for constrained and unconstrained corporations. Next, the results from the baseline model are presented. Then, the chapter displays the results of our main empirical model. Finally, the findings for high-growth firms as well as for low-growth firms along with the results for high-investment and low-investment firms are presented in this chapter.

The final chapter, Chapter 5, provides synopsis of the thesis and key findings of our empirical analysis. Policy recommendation and economic justification of the findings are

also given this chapter. Finally, the chapter is concluded by presenting limitations of the study and further worth exploring directions in this area.

Chapter 2

Review of Literature

2.1 Introduction

In this chapter, we review the theoretical and empirical studies related to the cash holding behavior of firms. Specifically, this chapter describes the different economic and finance theories that explain why and when corporate companies build their cash reserves. This chapter also explains why financially constrained and unconstrained firms respond differently to firm-specific variables when making cash holding decisions. In this chapter, we also provide a detail review of the empirical findings of the previous studies that have related the various firm-specific characteristics such as firms' cash flows, the volatility (unpredictable variations) of cash flows, the leverage of firms, the market to book value of assets (Tobin's Q), dividend payments, and the size of firm to cash accumulation. Finally, we review the studies that have examined the cash structures of Pakistani firms.

2.2 Cash Holding of Firms: Economic Theory

In a world where financial markets are perfect and frictionless, accumulation of liquid assets does not have any positive effect on corporate values. If a firm faces an expected short fall in its cash reserves and thus, it has to acquire capital from external resources to carry out its daily operation and to finance its investment projects, the firm can obtain the required funds at most zero cost. In such world, the liquidity premiums do not exist and therefore, the opportunity costs of keeping cash and other liquid assets would be zero. In

this context, the wealth of equity-holders would remain unchanged if a firm does investment in liquid assets by borrowing money from capital markets.

On the flip, if unavailability of cash is costly for firms, then firms equalize incremental costs of keeping liquid assets to the additional benefits of holding liquid assets. However, adding an extra rupee to liquid assets not only declines the likelihood of being short of cash but also it reduces the cost of facing short falls in cash. Nevertheless, the incremental benefit of cash holdings declines with accumulation of liquid assets. Several researchers are of the similar view regarding firms' liquid asset holding and the costs and benefits associated with those holdings (Johan (1993), Kim et al. (1998), Opler et al. (1999), Dittmar et al. (2003), Foley et al. (2007), Drobetz and Grüninger (2007), Harford et al. (2008), Duchin (2010), Bigelli and Sánchez-Vidal (2012), and Uyar and Kuzey (2014)).

Most of researches have explained the dynamic of firms' cash holdings in line with the three prominent finance theories, namely, the trade-off theory of Miller and Orr (1966) and Myers (1977), the free cash flow theory of Jenson (1986), and the pecking order theory of Myers and Majluf (1984). Including several others, these studies are Opler et al. (1999), Dittmar et al.(2003), Ferreira and Vilela (2004), Foley et al. (2007), Drobetz and Grüninger (2007), Chen (2008), Harford et al. (2008), Duchin (2010), Kim et al. (2011), Al-Najjar and Belghitar (2011), Bigelli and Sánchez-Vidal (2012), and Uyar and Kuzey (2014).

Different finance theories provide different explanations of why and when corporate firms hold large amounts of cash. Following are some important theories that

describe the optimal level of cash holdings of corporation. Specifically, in Section 2.1.1, we presents the trade-off theory (Myers (1977)), while, in Section 2.1.2, we describe the pecking order theory (Myers and Majluf (1984)). Finally, we review the free cash flow theory proposed by Jensen (1986) in Section 2.1.3.

2.2.1 Trade-off Theory and Cash Holdings

According to the trade-off theory, corporations set their target level of liquidity by balancing the marginal cost of holding additional cash and the incremental benefit of holding extra rupee of cash (Miller and Orr (1966) and Myers (1977)). Several studies, for instance, Ferreira and Vilela (2004), have pointed out the most obvious benefits of cash reserves as follows. Cash holding lowers the probability of financial distress, it reduces the cost of rising external financing, it avoids the costly liquidation of assets, and it enables the firms to undertake the investment policy when they face financial constraints in acquiring funds from external capital markets.

On the other hand, the most considerable costs of keeping the liquid assets more than the required level are low interest income from investment in such assets due to liquidity premium, tax disadvantages because of double taxation, and agency costs. Under the trade-off model, firms have their cash targets, which are set by considering the marginal costs and benefits of cash. Concerning the benefits of keeping cash, cash holding is important for financing growth opportunities of corporation, particularly when the corporation faces difficulties in raising funds from external resources. Further, it provides a safety buffer, which allows the corporation to shun the costly external financing or liquidating of assets. The major costs of shortfall in cash are the costs of

financial distress and the opportunity cost of not doing the investment, which may have a positive impact of the firm value. In case shortage of liquidity forces the corporation to leave valuable investment projects.

2.2.2 Pecking Order Theory and Cash Holdings

According to the pecking order theory, firms do not have predetermined target level of leverage and cash. Rather, they follow strictly hierarchy when financing their investment and other capital needs. In particular, firms' first use internally generated funds, then debt and as a last resort, they issue new equity. Myers and Majluf (1984) reported two main themes of the pecking order theory. First, the use of internal finance for investment is more preferable for the firm over external financing. Second, debt financing is more preferable for a firm than equity financing when external financing is needed.

Lack of information raises asymmetric problems between firm managers and outsider investors that make expensive external finance. Hence, the firm will not be able to sell the securities at their definite value. To avoid security issuance at low prices, the firm would opt to not undertake the investment project; even it has a positive net present value. However, the firm can shirk this cost by keeping sufficient internally generated cash to reap the benefits of potential investment opportunities.

2.2.3 Free Cash Flow Theory and Cash Holdings

Jensen (1986) argues that when firm managers mount up their cash reserves for their own incentives regardless of whether the excessive cash has positive or negative effects on the value of their firms, and in turn, on shareholders' wealth. They build excess cash

balances to get control over more available assets and to avoid external financing when they need capital. Holding extra cash provides firm managers discretionary power upon firm investment policy and they carry out the investment projects even those projects do not have any significant positive impact on shareholders' wealth.

Due to information asymmetries, the outsider would not be able to know whether the managers are stockpiling excess cash to increase the value of firm or to pursue their own interests. Nonetheless, the possibility of using cash for attaining the management concerns would increase the cost of holding external cash. According to Opler et al. (1999), management may accumulate more cash balance because they want to keep funds under their control within corporation, and does not want to make payouts to shareholders. Yet, in case if the managers have more cash, they must find out the ways to use such idle cash. Thus, they are likely to undertake projects that are poor in nature or have low net present value when good projects are not available.

The predictions of different economics and finance theories regarding the impacts of firm-specific determinants of cash on the cash holding behavior of corporate firms are given in Table 1. The predicted relation of these factors with firms' cash-holding decisions is also presented in the table.

Table 1: Summary of Theoretical Predictions Regarding Cash Holding

Variable	Trade-off Theory	Pecking Order Theory	Agency Theory	Predicted
Cash Flows	Negative	Positive	–	Positive
Cash Flow Volatility	Positive	–	–	Positive
Firm Size	Negative	Positive	Positive	Negative
Leverage	Unknown	Negative	Negative	Negative
Payout Ratios	Positive/Negative	Negative	–	Positive
Tobin's Q	Positive	Positive	Negative	Positive

2.3 Motives of Cash Holdings

Besides of the above-mentioned theoretical models, there are various theoretical models proposed in the literature to describe corporate cash holding policies. These models state that there are different motives that persuade firms to hold cash in their reserves. In particular, the literature explains the following motives: (1) the transaction motive of cash holdings, (2) the precautionary motives of cash holdings, (3) the agency motives of cash holdings, and (4) the tax motives of cash holdings. Below in subsequent subsections we review the empirical literature regarding these motives of cash balances.

2.3.1 The Transaction Motives

The transaction costs motive provides a battery of predictions regarding the cash holding decisions of firms. Firms hold excessive cash amounts to diminish transaction costs. Many years ago, Keynes (1936) stated the transaction motive of cash holdings and argued that firms hold cash as cash fulfills the current personal and business transaction needs. Harvesting the benefits of economies of scale in acquiring external financing motivates firms to add internally generated funds to their cash stocks, which they consider as buffer. Doing this firms avoid frequent visits to external capital markets to raise funds. Increased cash holdings lower their pecuniary return, which is considered as the cost of cash holdings. If transaction costs exist, then one of the fundamental and important benefits of stockpiling of liquid assets is that firms may convert those assets into cash more easily.

However, there are opportunities costs of holding liquid assets, which are referred as liquidity premium. Furthermore, shareholders have tax disadvantages when firms

stockpile liquid assets. The accumulated interest income earned from a firm's holding of liquid assets is subject to double taxation. Thus, if the shareholders hold such securities directly, they could get higher pre-tax earnings. See, for further along these lines, Kim et al. (1998) and Opler et al. (1999).

Transaction cost motives of holding cash also explains why small and large corporation hold different amounts of cash. For instance, the benefits of economies of scale imply that smaller firms are more prone to hold liquid assets as compared to their large counterparts. Another proposition is constructed based on the notion that firms can increase cash via liquidation of assets (Shleifer and Vishny (1992)).

However, the transaction motive of cash would not exist in the world of perfect capital markets. Theoretically, it implies that there is no opportunity cost of holding liquid assets. But in real world cost involves in buying and selling of assets. In case of low cash holdings, firms can finance their investment and other capital needs through external borrowing from the capital market and by liquidating existed assets (Opler et al. (1999)). To raise funds through selling existing assets or by using external financing resources is expensive for firms. As a result, corporations hold cash and liquid assets to avoid these transaction costs (Bates et al. (2009)).

Discussing the costs and benefits of cash holding researchers, such as Baumol (1952) and Miller and Orr (1966), explain that when firms convert their illiquid assets into liquid assets for purpose of cash payments, they incur significant transaction costs. Thus, firms are likely to hold cash. However, there are also economies of scale for money

demand. Therefore, small firms accumulate more cash as compared to large firms (Mulligan (1997)).

2.3.2 The Precautionary Motives

Cash holdings of firms are also used to prevent firms against adverse shocks when external financing is costly (Pinkowitz and Williamson (2004)). Myers and Maljuf (1984) proposed that asymmetric information makes access to capital market costly for investors and managers and also suggest that firms hold more cash for better investment opportunities. As pointed out by Duchin (2007), there exists an inverse correlation between the precautionary purpose of cash and investment. Cash holdings offer easy and cheaper financing and help firms to prevent from future external funds uncertainty.

Both empirical and theoretical research on holdings of cash has generally supported for the precautionary motive. Opler et al. (1999) have documented evidence that corporate firms accumulate more cash when they are uncertain regarding their future cash flow streams and when their access to external capital market is restricted and poor. Firms hold more cash reserves for better investment opportunities, as an adverse shock would be more costly for them.

According to Pinkowitz and Williamson (2004) firms always want to invest in those projects that have a positive NPV. Firms do so even they are unable to generate sufficient internal liquidity. Cash accumulation by the corporations in the past would definitely help these firms to undertake future investments having a positive NPV, even in case of expensive external finance. Ozkan and Ozkan (2004) state that the

precautionary purpose of cash requires cash stockpiling for unanticipated investment opportunities when other sources of liquidity are high (Ozkan and Ozkan (2004)).

Almeida et al. (2004) discussed and investigated the precautionary purpose of cash and found that firms those have limited access to financial markets invest out of their cash flows, while firms those can easy tap external financing do not use cash flows for such purpose. Han and Qiu (2007) extended the model proposed by Almeida et al. (2004). They showed theoretically that the heightened cash flow volatility instigates financially constrained firms to increase their cash holdings. But such positive relationship either does not hold or is weak for financially unconstrained.

There is also empirical evidence, which supports these predictions. In particular, both these studies have shown empirically that although there is significant and positive relationship between cash holdings of financially constrained firms and variations in their cash flows, the cash flow volatility does not have any significant influence on firms' cash-holding structure. The empirical results of both these studies strongly support the precautionary motive of Keynes (1936). Moreover, Almeida et al. (2007) demonstrated a model that indicates that firms hold more cash in spite of decreasing debt due to association between investment opportunities and low operating income.

2.3.3 The Tax Motives

Firms also hold cash to get advantages in taxes, particularly, multinational corporations (MNCs). For example, Foley et al. (2007) found that MNCs accumulate higher cash balances in order to pay the tax consequences linked with repatriating foreign earnings.

They investigated whether larger tax costs linked with repatriation lead to higher cash holdings. They showed that corporations hold large amounts of cash in case of high repatriation tax costs than firms with low repatriation tax costs. They also found that financially unconstrained firms are more sensitive to repatriation tax costs and vice versa. Therefore, firms with low debt rating or high level of leverage have no statistically significant relation between cost of repatriation tax and their cash holdings.

As explained by Opler et al. (1999), corporate income taxes are positively related to the cost associated with accumulation of liquid assets. This is because accrued interest income is taxed twice. They also explain that if shareholders do not pay taxes on capital gains, they opt their firms to utilize extra liquid asset stocks for repurchasing outstanding shares. By doing this, for such equity-holders, the marginal tax rate on the liquidity would be less than the corporate tax rate. This implies that there is a positive association between the costs associated with liquid assets and the corporate marginal tax rate. In this context, one can predict a negative impact of the incremental tax rate on the holdings of liquid assets.

2.3.4 The Agency Motives

Firms hold cash to fulfill the need of agency cost as well. According to Jensen and Meckling (1976), this cost occurs due to contradictory interests between debt and shareholders. These conflicts increase the costs of external financing. The problem of agency cost can identify looking at firms' cash holdings. Jensen (1986) further argued that if firms face the problem of investment opportunity, then mangers prefer to retain cash rather than to pay it to the shareholders as cash dividends. However, such holdings

are usually considered as an extra amount of cash holdings for the precautionary and transaction purpose.

Opler et al. (1999) have also similar views. Specifically, they argue that excess cash holdings avoid market discipline upsurge, the degree of risk aversion, and in turn, make firm managers more unwillingness to take risk. Market self-restraint appears when firms have to visit external capital markets to raise new funds. However, the corporate firms may sidestep monitoring of capital markets regarding their investments and other operations by holdings cash in their reserves. Similarly, Kalcheva and Lins (2007) have pointed out that the holding of excess amounts of cash is not valuable for firms those operating in the countries in which the rights of shareholders are less secured and corporations accumulated more cash in their reserves.

Dittmar et al. (2003) found evidence that corporate firms those face agency problems hold large amount of cash. Mahrt-Smith and Dittmar (2007) and Pinkowitz et al. (2006) also found that cash becomes worthless due to agency problems between external and internal equity holders. Moreover, there is empirical evidence showing that entrenched managers of firms are more prone to build excess cash stocks. Nonetheless, they spend these surplus cash amounts more quickly for the sake of their personal benefits (Harford et al. (2008)).

2.4 Empirical Evidence on Cash Holdings

The basic aim of this part of dissertation is to highlight the empirical evidences regarding cash holding behavior of firms. Researchers have documented significant evidence regarding the status of corporate firms' cash holdings. There is also empirical evidence of

the differential sensitivity of cash to its determinants across financially constrained and unconstrained firms. Further, several studies have successfully linked the dynamic of cash holdings to firms' growth opportunities.

Gill and Shah (2012) pointed out that Cash and holding the cash is an utmost important constituent for several corporate firms and business to make them immune of bankruptcy and enable them to prosper. Firms hold cash for different purposes as holding cash makes the firms capable of paying their payments on time. Cash hoarding is required for sustainable profits and sales growth of firms. As explained by Cossin and Hricko (2004), accumulation of cash allows firms to undertake optimal investments and it also helps firms to avoid frequent external financing, which is costly for them.

2.4.1 Firm Characteristics and Cash Holdings

There are a number of empirical studies in the existing literature that already have defined the target level of cash holdings, in order to determine the firm-specific characteristics. Specifically, the key findings emerging from these empirical studies suggest that various firm-specific determinants have important and pronounced effect in explaining the level of firms' cash holdings. Further, most of these studies document that leverage and the size of firm negatively affect the level of firms' cash balances. Nonetheless, the existing studies also explain that cash holdings of firms significantly and positively associated to the cash flows and the market to book value (Tobin's Q).

The cash holding of firms is also positively related with the cash flow volatility. Below we briefly review the findings of previous studies. Specifically, we focus on the

empirical evidence on the impact cash holdings of the variables that we use in our empirical analysis. These variables are cash flows, the cash flow volatility, firm size, leverage, dividend payments, and the market to book value. Table A.1 in Appendix A presents the summary of predicted sign of the existing empirical results of the association between firm-specific determinants and the cash holdings of firms.

2.4.1.1 Firm Size and Cash Holdings

Trade-off theory supports the negative association between the corporate cash holdings and the firm size. According Mulligan (1997), this negative association can be explain as follows. The firms which are big in size can get more benefit from the economies of scale. Further, Titman and Wessels (1988), explain that although larger firms are more likely to diversified in their business have relatively more sustainable cash flows and are exposed to less financially constrained counterparts. According to Ferri and Jones (1979), larger firms can raise funds from external capital market relatively easily and at favorable terms when they need. Thus, they are prone to decrease their amounts of cash with their size.

As explained by Miller and Orr (1966), larger firms can get benefit of cheaper financing in better and easier way due to the economies of scale in the cash holding polices of firms (Bigelli and Sánchez- Vidal(2012)). Further, Rajan and Zingales (1995) also pointed out that as, big firms are mostly diversified and face less problem of financial distress. Kim et al. (2011) also argued that fixed costs allied with borrowing are not proportional to loan size, and are relatively more unwieldy for smaller firms. So, these are the important factors that show the negative association between level of cash

holdings and the firm size of firms. Pecking order model also provide evidences that there exists a positive association between the holding of cash and the firm size.

Empirical literature also provides the evidence regarding indirect association between cash holdings and the firm size through information asymmetric. As it is explained in Harris and Raviv (1990), big firms are expected to suffer less from information asymmetries. Therefore, they face fewer hurdles and incur less cost in obtaining funds from external capital markets. Thus, contrary to small firms, firms those are big in size hold considerably less cash in their hand to avoid pass up valuable investments.

Various studies in existing literature (such as Opler et al.(1999), Almeida et al. (2004), Ozkan and Ozkan (2004), Ferreira and Vilela (2004), Han and Qiu (2007), Bates et al. (2009), and Gao et al. (2013)) reported the negative association between cash holdings and firm size on the other side, a few studies (Guney et al. (2007), Harford (1999), Ahsan and Ullah (2013)) documented the positive relation between these variables. Bigelli and Sánchez-Vidal (2012) investigated the negative association between corporate cash holdings and firm size of private firms. Lee and Song (2007) provided evidence that cash holdings of firms has been increased everywhere due to financial crises in Asia not because of firms size.

2.4.1.2 Leverage and Cash Holdings

Both trade-off and pecking order models of cash predict an inverse relationship between leverage and the corporate cash holdings. The trade-off theory states that leverage inversely affects the firms as due to greater amount of taking debt firms may experience

financial disaster, which ultimately causes liquidation. For minimizing this insolvency firms should hold more cash rather than having leverage. On the similar lines, firms consider cash as negative debt according to pecking order model. Firms that have more extra cash can either retire their outstanding debt or add it to their reserves. It is also hypothesize that though firms have in their mind a target level of debt, they manage their cash reserves in manner of pecking order theory (Opler et al. (1999)). The free cash flow theory also states the negative effect of cash reserve and the leverage, and also explains that firms are not required more external monitoring in cash of low levered. Thus, managers of these firms can create more managerial discretion, which results in accumulation of cash.

Leverage has a greater connotation in formulation of policies of any firm cash. Different approaches are also found on the relationship between leverage and cash reserves in the literature. For instance, John (1993) found leverage as substitute against non-reservation of cash for firms. If a firm does not hold cash generally, it has the prospect to have borrowing from capital market. Furthermore, studies argued a negative association between balance of cash and leverage for maintaining financial flexibility of firms if they have low leverage; so firms usually reserve cash rather having debt (Graham and Harvey (2001)).

Moreover, Fazzari et al. (1988), it is generally considered that financially constrained firms have greater chance to have accumulation of cash. Conclusively, it can be said that leverage has a significant association with balance of cash. If firms do not reserve accumulation of cash, they will be more dependent on external capital and more likely of having high leverage. As explained by Ferreira and Vilela (2004), it is generally

believe that if leverage is positively and significantly related to the likelihood of bankruptcy then one would expect a positive link between leverage and corporate cash holdings. Although, high ratio of leverage that caused to increase the probability of bankruptcy, so in order to keep safeguard, firms are likely to hold excess cash balance in their reserve.

Most of the earlier studies have discovered that leveraged firms accumulate less cash balance (Opler et al. (1999), Ozkan and Ozkan (2004), Ferreira and Vilela (2004), and Al-Najjar and Belghitar (2011). Similarly, Guney et al. (2007) investigated the cash holding status of firms among different countries (such as, the UK, Germany, France, and Japan). Particularly, they focused on the relationship between leverage and the level of cash holdings. They provide evidence of non-linear association between leverage and cash holdings. Uyar and Kuzey (2014) found the negative impact of leverage on firms' cash holdings. According to Gill and Shah (2012) leverage significantly affects the corporate cash holdings. Chan et al. (2013) also pointed out that marginal rate of cash reserves to shareholders reduces with higher cash reserves and larger leverage. There are few studies in the previous literature that have provided evidence of positive impact of leverage on cash holdings of firms such as, Harford (1999), García-Teruel and Martínez-Solano (2008), and Bates et al. (2009).

2.4.1.3 Cash Flow and Cash Holdings

Explaining the cash holdings behavior of corporate firms linked with firms' flow of funds, existing literature has mainly two contending theoretical approaches, namely the trade-off and the pecking order. According to the trade-off theory cash flow gives a ready

source of cash to firms. According to Kim et al. (1998), cash flow can be explained as the cash substitute for a firm. Therefore, a negative association can be expected between firms' cash flow and cash levels. Later on, Kim et al. (2011) empirically found a negative link between these two variables as cash flow from operations reduces the need to hold excess cash balances.

On the other side, the pecking-order model of cash reserves points out a positive influence of flow of funds on cash holdings of corporations. In this regard, Opler et al. (1999) analyzed the firm-specific factors of determining cash holdings of the US publically traded corporate firms over the period of 1971-1994. They found evidence that flow of funds positively affects the cash holding of firms. Similarly, Ferreira and Vilela (2004) tested their model using the sample of listed firms of EMU (European Economic and Monetary Union) for the period of 1987-2000 to investigate the firm-specific characteristics of holding cash. They found supportive evidence that cash holding levels of firms are positively allied to cash flows of firms. Ozkan and Ozkan (2004) explained the important dynamic impact in their study of firms' determination of cash holdings and provided a positive relation of cash flow with firms' cash stockpile.

Several other studies, such as Almeida et al. (2004), Saddour (2006), García-Teruel and Martínez-Solano (2008) Gill and Shah (2012), and Uyar and Kuzey (2014) also found a strong positive link between these two variables. Specifically, According to Uyar and Kuzey (2014), there is a positive and strong connection between cash flows and the cash level of firms. Contrary to this, studies such as, Guney et al. (2007), Chen

(2008), Bates et al. (2009), and Duchin (2010) found inverse relationship between firms' flow of funds and their cash stockpiling.

2.4.1.4 Cash Flow Volatility and Cash Holdings

In line with the model of trade-off, a positive link is expected between volatility of cash flow and the cash holdings. Consistent with the prediction of the model of trade-off, the pecking-order theory, and the precautionary purpose of holding cash, Custodio et al. (2005) found that US financially constrained firms hold large amount of cash in case of having large cash substitutes and with more cash flow uncertainty. On the other hand, financially unconstrained firms hold small amount of cash holdings. Ozkan and Ozkan (2004) pointed out that in case of the UK liquidity constraints firms need to build up more cash reserves due to more volatile flow of funds. Opler et al. (1999) also provided evidence that the US firms mount up large amount of cash with large cash flow volatility.

Several previous studies (e.g., Han and Qiu (2007), Harford et al. (2008) Bigelli and Sánchez-Vidal (2012), and Gao et al. (2013)) strongly support the view of the positive relationship between the cash flow volatility and the cash holdings of firms. However, the findings of existing studies are inclusive regarding the direction of the significant link between cash flow variability and cash holdings. Specifically, as noted by Bates et al. (2009), variability in the cash flow positively affects the cash holdings of corporations. Limited evidence found in the existing litterateur about the inverse relation between the volatile cash flow and the cash reserves of firms. For instance, studies of Chen (2008) and Duchin (2010), found that cash flow variability and cash holdings of firms are negatively allied with each others.

2.4.1.5 Firm Dividends and Cash Holdings

Dividend payment is another variable which is expected to have a significant influence on corporate cash holdings. However both theory and empirical evidence suggest both negative and positive effects of dividends. According to trade-off theory of cash holding, there is a negative link between dividend payments and cash holdings. Bates et al. (2009) explained that non-dividend paying firms build up more cash to fulfill the demand of precautionary reason of cash. As noted by Opler et al. (1999) and Ferreira and Vilela (2004), non-dividend paying firms utilize capital markets in order to raise funds. On the other side, Pinkowitz and Williamson (2001) explained the positive impact of dividend payments on level of cash holdings. Similarly, Ozkan and Ozkan (2004) found the positive link between the two variables.

Several studies in the existing literature consider the non-dividend paying corporations to be more financially constrained. For example, Almeida et al. (2004) model, they explained that firms accumulate more cash when they have limited access to capital market. Further, Han and Qiu (2007) found that non-dividend paying firms increase their cash holdings for precautionary reason. Saddour (2006) found that mature firms increase their level of cash with the payments to their shareholders as dividend. Drobetz and Grüninger (2007) focused on the cash holding determinants of nonfinancial firms of Swiss over the period of 1995-20004. They found a positive relation between dividend and cash holdings.

Custodio et al. (2005) showed the evidence that financially constrained firms hold more cash reserves to pay more dividends, while financially unconstrained firms do not

do so. Bigelli and Sánchez-Vidal (2012) also noticed in their study that private firms keep more cash for paying dividends than the firms those do not pay dividends. They explained that private firms more likely to use available cash at the time of need when they face difficulty in reaching the external funds and therefore, are likely to cut dividend payments to hold cash in hands. Yet, Foley et al. (2007) also observed that corporate cash holdings are also considered to be more important for non-dividend payout firm. Ferreira and Vilela (2004) found no significant association between cash reserves and dividend payments of firms.

Few empirical studies also found an inverse relationship between cash holdings and dividend payouts. For example, Dittmar and smith (2007) Gill and Shah (2012), Gao et al. (2013), and Kim et al. (2011) found negative relationship between dividend payments and cash holdings of firms.

2.4.2 Investment and Growth Opportunities and Cash Holdings

The financing hierarchy (pecking order) model predicts a positive association between cash holdings and investment opportunities significantly, the model practice that firms with more investment opportunities hold more cash. Kim et al. (1998) also found that firms hoard more cash reserves with high-investment options. Further, Opler et al. (1999), Guney et al. (2007), Bates et al. (2009), and Duchin (2010) found the similar results. On the other side, consistent with the trade-off model of cash holdings, Harris and Raviv (1990) and Opler et al. (1999) provided supportive evidence that firms having larger growth-opportunities keep relatively large amount of cash balances. They explained that firms might encounter larger external financing costs because of high level

of financial distress and problem of underinvestment. Firms are also more likely to maintain larger amount of cash for precautionary motive. Firms do so in order to decrease the costs of financial distress and turning the estimated connection between cash holdings and growth opportunities a constructive one.

Under the agency model of cash reserve a negative link exists between cash holdings and investment potential of firms. A possible explanation of this behavior of firms is that entrenched managers of corporate firms having high-investment opportunities chose to accumulate more cash balance for their personal edeavours (Opler et al. (1999)).

Hofmann (2006) provided evidence regarding the impact of cash holdings of corporate firms on non-financial corporation's of New Zealand. He anticipated that the key factors of corporate cash holdings are cash flow uncertainty, growth opportunities, dividend payments and the leverage level. Specifically, it is explained that linked to improved high-growth rates and investment potential, firms having high level of cash balances also possess the happening of operating losses (Opler et al. (1999), Mikkelson and Partch (2003).

Having larger growth-opportunities, firms are choose to build more cash balances in turn to decrease the probability of forgoing investment (see, e.g. for further detail, Ferreira and Vilela (2004), Guney et al. (2007), Kim et al. (2011), and Uyar and Kuzey (2014)). Specifically, Ozkan and Ozkan (2004) argued that corporations demands holding excess cash with high investment options helps to decrease the costs of financial distress. These arguments are consistent with trade-off model of holding cash. Moreover, as in

Ferreira and Vilela (2004), under the pecking order model, profitable investment options insist the firms to build up more cash that leads to a positive connection between investment options and cash level.

Various studies in the empirical literature generally exhibit a significant positive link between cash reserves and investment/growth opportunities (options) (e.g. Opler et al. (1999), Almeida et al. (2004), Harford et al. (2008), García-Teruel and Martínez-Solano (2008), Duchin (2010), Rizwan and Javed (2011), Al-Najjar and Belghitar (2011), and Uyar and Kuzey (2014)). On the other hand, some studies found a negative relationship between growth options and cash holdings of firms (Han and Qiu (2007), and Bigelli and Sánchez-Vidal (2012)).

2.4.3 Financial constraints and cash holdings

One more well researched area for the cash holding trends is the linkage between the cash holdings and the financial situation. The existing literature tells us that most of the firms use their available fund and not borrow because of high cost and interest rate. This is how firms rely at their and available cash flows. This literature has expanded over the last few decades and has got more attention (Crisóstomo et al. (2012)). The observance shows that those firms which have less available finances get troubled with the availability of external finances, having such borrowing cause very much expensive and to some point close down the firm from the capital market. In comparison to firms which have the capacity to raise the external finance with low cost are free from any constraint. The outcome of financing terms and conditions has been rigorously studied and

observed in the existing finance literature. Myers and Majluf's (1984) theoretical model has presented that when firms have lack of internal funds, it don't invest any more. Almeida et al. (2004) about cash holdings and firm's financial situation tells the trend between the firm's financial constraints and its behavior of liquidity of funds. The given model was testified during the time 1971-2000 on manufacturing industry and found that the cash flow behavior had no effect on the firms which were free from any constraint but had highly positive effect on firms which had constraints. They also developed the hypothesis that along the business cycle the cash flow trends change for the financially constrained firms after the negative macroeconomics trends. In contrast to which it has no effect at all on the firms which don't bear any financial constraint.

Custodio et al. (2005) has interrelated the cash holdings to the macroeconomic situation and firms specific variables. They also investigated that if there is any notable difference in the cash levels between firms with financial constraint and firms free from any constraint in relation to that the firms with constraint build up cash when there are macroeconomic difficulties. Their study was based on the sample of the US firm during the years 1971-2002. Their study has strongly supported the trade-off, the precautionary and pecking order theories. They found that the constrained firms with more substitute to the cash, extra dividend paid and more cash flow instability in comparison to the constraint free firms grasp less cash according to the trade off model. The firms having constraint are found to have excess cash for the time of uncertainty as they cannot access to the capital market.

The model given by Almeida et al. (2004) was further enhanced by Han and Qiu (2007) to investigate the role of financial unavailability and the linkage between cash

holdings and the variability of cash flows. They discussed that when the firms have free access to the external funds, then it's needless to fulfill the investment desire and the cash flow variability should not be based on its cash policies. Their sample study in the US trade firms showed that the linkage between the two variables is based on the financial constraint beard by the firm. Once they used the size of the firm as a substitute of financial constraint faced bore by the firm, they found that the cash holdings for the firm smaller in size reacts positively to the cash flow variability where as this trend is not noticed in the firms with large size and volume.

Almeida et al. (2009) expanded the analysis offered in Almeida et al. (2004) and found in comparison to their earlier results that the cash flow sensitivity of cash can be either positive or negative for the firms which are financially constrained. Acharya et al. (2007) found that the cash flow sensitivity of the cash relied on the financially constrained firm's hedging requirements. When the hedging requirements are at maximum then the firms with financial constraints are inclined to save cash out of their cash flows. Chan et al. (2013) reiterated that the firms with financial constraints have notably high marginal value of cash holdings.

Another stream of literature review examines the cross-sectional determinants of cash holdings and inquired about the link between cash holding and cash flow volatility. For example, a study by Kim et al. (1998) and Harford (1999) stressed the existence of positive and statistic affinity between cash holdings and industry cash flow volatility. The results second the argument that more cash is held by financially constrained firms as against financially unconstrained firms. Duchin (2010) found a significant

relationship between firm structure (whether diversified or single firms) and cash holdings of firms. The results showed that diversified (with two or more segments) firms hold considerably lower amounts of cash than stand alone firms due to investment opportunities. He further classified the firms into financially constrained and unconstrained in his analysis on the basis of five different index, (1) payout ratio, (2) Whited and Wu index, (3) firm size, (4) bond ratings, and (5) commercial paper ratings. He revealed robust effects of correlation between cash flows and investment opportunities in financially constrained firms. Tong (2011) also provided evidence that cash values are lower in diversified firms than in distinct counterparts and diversified firm is positively associated with lesser cash values for both financially constrained as well as unconstrained firms. He used two different measures, payout ratio and credit rating to categorize the firms into financially constrained and unconstrained.

2.4.4 Studies of Cash Holdings on Pakistan

The previous existing literature has also merely focused on the determinants of corporate cash holdings in Pakistan. Afza and Adnan (2007) have focused on exploring the factors determining the level of cash holdings of non-financial Pakistani firms. For the analysis, they used data set for the firm size, growth opportunities, cash flow, net working capital, leverage, cash flow uncertainty, and dividend payments. They found a statistically significant positive relationship between cash flows and firm size and negative relationships between net working capital, dividends, leverage, and cash holdings.

Ahsan and Ullah (2013) examined the impact of cash flow volatility on cash flow sensitivity by using a penal data set of 377 manufacturing firms of Pakistan. He found a positive impact of volatility of cash flow on cash flow sensitivity. For the analysis they further classified firms into financially constrained and unconstrained on the basis of two measures that are cash flow volatility and firm size. They revealed that cash to cash flow volatility in constrained firms is due to long-term debt and for unconstrained firm due to sales growth. They also argued that Pakistani firms hold excessive amount of cash to meet their future debt repayments.

Anjum and Malik (2013) examined the relationship between cash holdings of firms, net working capital, firm size, sales growth, leverage and cash flow cycle for Pakistani firms. They found a positive relation between holdings of cash and these particular variables and negative with sales growth. Rizwan and Javed (2011) showed that cash holding of Pakistani firm increase due to increase in market to book ratio and leverage. They also showed that cash holdings are insignificantly linked with leverage and networking capital.

While reviewing the earlier studies mentioned above, we find that there exists a relationship between various firm characteristics, such as leverage, cash flow, net investment, dividend, and firm size, and cash holdings behavior of firms (see, for example, Opler et al. (1999); Duchin (2010); Ozkan and Ozkan (2004); Guney et al. (2007)). On the basis of this review, our study contributes to literature on cash holdings on several grounds. First, we investigate the relationship between cash holdings and firm characteristics in a relatively developing country, namely Pakistan.

Second, we examine how financial constraints affect firms' cash holding decisions. For this purpose, we sort out firm-year observations using three alternative measures (such as, Whited and Wu index, firm size and dividend payout ratio) of financial constrained and run simultaneously examine the determinants of firm cash holdings across financially constrained and uncontained firms. In similar spirit, we examine the cash holding decisions of high-growth firms *versus* low-growth firms. Finally, we investigate whether firm investment opportunities affect firms' cash holding decisions. To do this, we identify firm-year observations when firms do low-investment and when firms do high-investment.

Finally, unlike prior empirical studies on this issue regarding Pakistan, we take into account the problem of endogeneity in the empirical analysis of cash holdings. Ozkan and Ozkan (2004) suggested that problems of endogeneity and heterogeneity are critical in firms' cash holding decisions and one should take into account while investigating the cash structure of firms. Therefore, we use system Generalized Method of Moments (GMM) estimation procedure to control the problem of endogeneity and heterogeneity.

Chapter 3

Empirical Framework

3.1 Introduction

In this chapter, we present our empirical models. Specifically, we first present baseline model to identify the firm-specific factors that are significant in explaining of cash holdings of firms. We then augment our baseline model to examine the influence of financial constraints on cash holding decisions of firms. Finally, we present the empirical model where we examine whether growing firms and firms those do more investment hold different amount of cash. In this chapter, we also discuss econometric methods that we employ to estimate our empirical models. Finally, this chapter provides data and variable definition.

3.2 Specification of the Baseline Empirical Model

To investigate the effects firm characteristics on the cash holding behavior of firms, we first estimate a baseline model. Following previous studies, such as Almeida et al. (2004), Ozkan and Ozkan (2004), Han and Qiu (2007), and Al-Najjar (2013), we formulate our baseline model as follows.

$$CH_{i,t} = \beta_0 + \beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1} + Y_t + V_i + \varepsilon_{i,t} \quad (1)$$

where subscript i and t denote firms and years, respectively. β_0 is the intercept and $\beta_1 - \beta_7$ are the coefficients of independent variables. Similarly, the dependent variable, $CH_{i,t}$is the cash holdings of firm i at time t. $CH_{i,t-1}$ is the cash holdings of firm at $t-1$ time. We include one period lagged value to control the inertia in the cash holdings behavior of firms. Studies such as Uyar and Kuzey (2014), Ozkan and Ozkan (2004), and Han and Qiu (2007) also include one period lagged of cash holdings into the set of independent variables while exploring the determinants of cash holding. $CF_{i,t-1}$ denotes cash flows of firm i at time $t-1$.[7]

We define the cash flows of a firm as the ratio of income before tax plus depreciation to the book value of total assets of the firm. $CFV_{i,t-1}$ is the volatility of cash flow for firm i in period $t-1$, which we proxy by the standard deviation of the cash flow for each firm over the sample period. Firm size, $SIZ_{i,t-1}$, is defined as the natural logarithm of the total assets adjusted with inflation using consumer price index (CPI). Cash management of firms given the economies of scale potentially relies on their size that is smaller firms may possess higher cash to assets ratio in comparison to larger ones. Leverage, $LEV_{i,t-1}$ is defined as the ratio of total debt (short-term debt plus long-term debt) divided by the book value of total assets for firm i in period $t-1$.

Higher level of leverage requires firms to hold more cash reserves cash, which is necessary for the adjustment of prospective debt payments. $DIV_{i,t-1}$ denotes the cash payment of dividends by firm i in period $t-1$. We use Tobin's Q, $TQ_{i,t-1}$, as a proxy

for firm growth opportunities. We predict that corporate firms with greater growth opportunities are prone to have more cash balances to get benefit from future investments. V_i and Y_t (vector of year dummies) denote firm-specific fixed effects and year-specific time-invariant effects, respectively.[8] Finally, the term $\varepsilon_{i,t}$ represents residuals. In order to mitigate the problem of endogeneity, we use one year lagged value of all independent variables in our empirical model, that is, we run current period cash holdings of firms on the one year previous independent variable. In this frame work, our independent variables are lagged one year after cash holdings. Therefore, it is very likely that any change in regressors in year $t-1$ may cause changes in cash holdings of year t. However, cash holdings in year t do not have any impact on the regressors in earlier year. Thus, it is much more likely that the causality runs from regressors to cash holdings than vice versa.

3.2.1 Financial Constraints and Cash Holding

In this subsection, we emphasized on exploring the influence of financial constraints on the cash holding decisions of firms. A firm would be considered as financially constrained when the cost of its external financing exceeds the cost of internally generated capital (Chan et al. (2013)). However, following such kind of definition, one cannot get a precise guidance to identify whether the firm is financially constrained or unconstrained. Nevertheless, the standard finance literature has suggested that the firm

[8] Although firm-special fixed impacts are considered to be unobservable, these factors are important in explaining firms' cash holding structure. One should also note that these effects are different for different firms, yet remain fixed for the underlying firm over the sample period. On the other side, the year-fixed effects are same for all firms included in the study, but these effects vary across time (Ozkan and Ozkan (2004)).

would be considered as financially constrained if it lies in at least one of the following categories: (i) small in size, (ii) more growth potential, (iii) less debt capacity, (iv) unprofitable, (v) higher level of leverage, (vi) low credit rating, (vii) do not pay dividends, (vii) hold less amount of cash, and (viii) new in business (Opler et al. (1999), Almeida et al. (2004), Arslan et al. (2006), Chang et al. (2007), Acharya et al. (2007), and Duchin (2010)).

To examine how financial constraints affect firms' cash-holding structure, it is essential to categorize firms into financially constrained and unconstrained. Existing empirical work has suggested a number of measures. Yet, there is no consensus on one measure. Indeed, what comprises a fine financial constraint measure is one of the central attentions in recent empirical work. For example, several researchers, such as, among others, Fazzari et al. (1988), Opler et al. (1999), Almeida et al. (2004), Arslan et al. (2006), Acharya et al. (2007), Fresard (2009), and Duchin (2010), Denis and Sibilkove (2010), and Chan et al. (2013), have utilized different and more than one measures of financial constrained to split firms into financially constrained and unconstrained.

Hennessy and White (2007) examined the robustness of four diverse proxies for financial constraints by utilizing simulated data in a dynamic framework. They argued that selection of measures of financial constraints depends on the chore at hand. Further, rather than using the financial constrained measure based on a single firm characteristic, Kaplan and Zingales (1997) and Whited and Wu (2006) proposed financial constraints indices. They constructed the index by utilizing more than one firm-specific characteristic related with external finance constraints. There is still ongoing debate on the effective of

any specific measure of financial constraints. One should note that, in this study, however, we do not aim at passing any judgment on the merits and demerits of each gauge (measure).[9] However, we use the measures in our study that are most commonly used in the literature.

There is no general criterion to select which financial constraints scheme is the best measure to identify whether a firm is financially constrained or unconstrained. Therefore, researchers have used more than one measure of financial constraints. Following this pattern, we also use different measures of financial constraints. Specifically, to estimate the level of financial constraints, we follow Duchin et al. (2010), Duchin (2010), Almeida et al. (2004), and Whited and Wu (2006).In particular, we use three different techniques. These measures are:(1) firm size (previously used by Gilchrist and Himmelberg (1995), Opler et al. (1999), Almeida et al. (2004), Arslan et al. (2004), Han and Qiu (2007), Acharya et al. (2007), Campello et al. (2010), Duchin (2010), and Luo (2011)), (2) dividend payout ratio (earlier used by Fazzari et al. (1988), Almeida et al. (2004), Arslan et al. (2004), Duchin (2010), Duchin et al. (2010), Denis and Sibilkov (2010), and Luo (2011)), and (3) financial constraint index proposed by Whited and Wu (2006) (hereafter WW) (formerly used by Fresard (2009), Duchin (2010), and Duchin et al. (2010)). We use the annual median value of the firm size measure, the payout ratio measure, and the WW index measure across firms as the cutoff point in order to segregate financially constrained and financially unconstrained firms. Below we briefly discuss each of ours

[9]In the literature, researchers (see, for instance, Duchin (2010); Denis and Sibilkov (2010); Almeida et al. (2007)) have implemented different measures to stratify firms into financially constrained and unconstrained groups. Yet, we cannot see consensus on the use of any single financing constraints measure.

measure and reviews the studies that have used these financial constraints measures in their empirical work.

A. Firm Size

The first measure that we use in our analysis to identify financially constraints and unconstrained firms in size of firms. Specifically, based on the size, the sample firms are categorized into financially constrained and unconstrained groups. A firm would be belonged to financially unconstrained category in a particular year if the firm lies in the top median of size distribution of the corresponding year, whereas, a firm would be classified as financially constrained in the year if the firm is in the bottom median of size distribution for the corresponding year. This approach is same as of Gilchrist and Himmelberg (1995), Opler et al. (1999), Almeida et al. (2004), Arslan et al. (2004), Han and Qiu (2007), Acharya et al. (2007), Campello et al. (2010), Duchin (2010), and Luo (2011)), who also separate financially constrained firms from those that are financially unconstrained firms based on their size.

B. Dividend Payout Ratio

The second measure of the financial constraints that we use in our study is dividend payout ratio. In order to classify firms into financially unconstrained and constrained Chan et al. (2013) used the approach of dividend payout approach. They argue that financially constrained firms face imperfect access to external capital, when capital markets having information asymmetries. As a consequence, these corporations opt to hold large portions of income as cash reserves and therefore, pay less cash dividends. Likewise, Fazzari et al. (1988) argued that firms those have limited access to external

capital markets are unlikely to distribute cash among shareholders as dividends. Following these previous studies, we identify a firm as financially constrained if the firm does not pay dividend during an accounting year. On the other hand, a firm is considered as financially unconstrained in a year if the firm does pay the dividends during the year. Fazzari et al. (1988), Almeida et al. (2004), Arslan et al. (2004), Han and Qiu (2007), Duchin (2010), Duchin et al. (2010), Denis and Sibilkov (2010), and Luo (2011) also distinguish firms into financially constrained and unconstrained in similar spirit.

C. Whited and Wu index

The final and third measure of financial constraints that we use to differentiate whether firms are financially constrained or unconstrained is the index proposed Whited and Wu (2006). We rank firms as financially constrained and unconstrained based on the WW index. In particular, in a given year, those firms would be assigned to the financially constrained type whose firms WW index lies below the annual median WW index value of all sampled firms in the given year. Analogously, those firms are classified as financially unconstrained in a given year whose WW index is above the annual median WW index value in the corresponding year. The previous empirical studies such as Fresard (2009), Duchin (2010), and Duchin et al. (2010) also used the WW index to sort out firms into financially constrained and unconstrained.

The Whited and Wu (2006) index is explained as follows:

$$WWI_{i,t} = -0.091 \times CF_{i,t} - 0.062 \times DD_{i,t} + 0.021 \times LTD_{i,t} - 0.044 \times SIZ_{i,t} + 0.102 \times ISG_{i,t} - 0.035 \times SG_{i,t}$$

where, $CF_{i,t}$ is the cash flows of firms. We define cash flows as pre-tax income plus depreciation divided by the book value of total assets. $DD_{i,t}$ is dividend dummy. We assign one the dummy if the firm pays dividend and otherwise zero. $LTD_{i,t}$ is the leverage ratio, which we define as total debt divided by total book assets. $SIZ_{i,t}$ is firm size which is defined as natural log of total assets normalized by CPI. $ISG_{i,t}$ denotes sales growth of the industry sales growth, which is defined as the first difference of log of total sales of firms belong the industry. Finally, $SG_{i,t}$ is firms' sales growth, it is defined as the first difference of log of firms' sales.

The main objective of our study is to examine the influence of financial constraints on firms' cash-holding decisions of firms. Yet, the baseline model presented in equation (1) doesn't enable us to examine whether financially constrained and financially unconstrained firms hold different amounts of cash. To resolve this issue, we extend our baseline model so that all variables of interest can assume a different coefficient across financially constrained and unconstrained firms within the same framework. To achieve our goal we generate two sets of dummies that allow us to separate financially constrained and financially unconstrained firms and interact them with all variables in the baseline model.[10] Specifically, we generate a dummy financially constrained dummy ($D_{i,t}^{fcon}$), which is equal to one for a firm in a given year if the firm is categorized as financially constrained and otherwise zero. Similarly, we generate financially unconstrained firm dummy ($D_{i,t}^{funcon}$), which is equal to 1 f a firm is

[10]Previous empirical studies on this issue do not follow this approach. Rather, they estimated regression separately for financially unconstrained and financially constrained firms (see, Duchin (2010), Han and Qiu (2007), Almeida et al. (2004)).

classified as financially unconstrained in the given year and otherwise it is zero. In particular, the extended model takes the following form:

$$CH_{i,t} = (\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}) \times D_{i,t}^{fcon} + (\beta_8 CH_{i,t-1} + \beta_9 CF_{i,t-1} + \beta_{10} CFV_{i,t-1} + \beta_{11} SIZ_{i,t-1} + \beta_{12} LEV_{i,t-1} + \beta_{13} DIV_{i,t-1} + \beta_{14} TQ_{i,t-1}) \times D_{i,t}^{funcon} + Y_t + V_j + \beta_0 + \delta D_{i,t}^{fcon} + \varepsilon_{i,t} \quad (2)$$

In equation (2), all the variables are described as in equation (1). This equation allows us to observe the difference in the response of cash holdings of financially constrained firms and financially unconstrained firms to the determinants of cash. If the estimated coefficient of $D_{i,t}^{fcon}$ is positive, then those firms whose excess to external capital market is restricted, hold more cash, on average. Several researchers in different area of finance have formulated their empirical framework in the similar fashion (see, for instance, Caglayan and Rashid (2014), Rashid (2012), and Goyal et al. (2011)).

3.2.2 Growth Opportunities and Cash Holding

Growth opportunities (potential) in corporations are a vital factor that significantly and positively affects the cash holdings. Several existing empirical studies have shown that firms significantly increase their cash with growth opportunities. In particular, studies by Kim et al.(1998) and Opler et al.(1999) have provided evidence of the positive association between firms' cash holdings and their growth possibilities. Similarly, some other studies have also reached at the same conclusion (Ferreira and Vilela (2004), Ozkan and Ozkan (2004), and Uyar and Kuzey (2014)).

According to the pecking order theory, those firms face more sever information asymmetries whose value is mainly determined with the growth opportunities. Consequently, corporations with higher growth opportunities incur larger cost of external financing, and therefore, they keep more cash in their tills to finance future investment projects. Another study by Saddour (2006) has also shown that growing firms accumulate larger cash balances as compare to mature firms. However, they shown that this positive association is stronger for growth firms than mature firms.

As mentioned earlier, the one of the aim of our study is to investigate the cash holding behavior of high-growth and low-growth firms. To do this, we first sort out the firms into high-growth firms and low-growth firms. Following Duchin (2010) and Saddour (2006) and we use the annual median value of Tobin's Q as a measure to separate high-growth firms and low-growth firms. We take annual median value of Tobin's Q as the cutoff point between high-growth firms and low-growth firms. A firm would be considered as high-growth (low-growth) firm for year t if the value of Tobin's Q of the firm for that particular year is greater (less) than the annual median value of Tobin's Q of all the firms included in the sample in the year. Similar to equation (2), we augment the baseline model to examine the role of growth potential in cash holding decisions of firms. Specifically, the model takes the following form:

$$\begin{aligned} CH_{i,t} = {} & (\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}) \times D_{i,t}^{hgrowth} \\ & + (\beta_8 CH_{i,t-1} + \beta_9 CF_{i,t-1} + \beta_{10} CFV_{i,t-1} + \beta_{11} SIZ_{i,t-1} + \beta_{12} LEV_{i,t-1} + \beta_{13} DIV_{i,t-1} + \beta_{14} TQ_{i,t-1}) \times D_{i,t}^{lgrowth} \\ & + Y_t + V_i + \beta_0 + \delta D_{i,t}^{hgrowth} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

In equation (3), all variables are similar to equation (1). $D_{i,t}^{hgrowth}$is high-growth firm dummy, which takes value one if the underlying firm has classified as high-growth firm in year t, and otherwise it takes zero. Similarly, $D_{i,t}^{lgrowth}$ is low-growth firm dummy, which takes value one if the underlying firm has identified as low-growth firm and otherwise zero.

3.2.3 Investment Level and Cash Holding

It is generally believed financing policy of corporate firms significantly related to available investment opportunities of firms and availability of internally generated funds. It is also evident of (Opler et al. (1999), Ozkan and Ozkan (2004), Denis and Sibilkove (2010), Uyar and Kuzey (2014), Duchin (2010), Bates et al. (2009), and Han and Qiu (2007)) cash holdings of firms is significantly associated with firms' investment opportunities. As it is explained in Caglyan and Rashid (2014) firms that have higher investment opportunities incline to have more liquidity assets. Firms do this because to avail their profitable projects (projects with positive NPV). Carrying out such projects has a positive impact of firms' value. Therefore, firms not having sufficient liquid assets incur higher cost to invest in such projects as they may or unable to finance all available projects through external financing.

An empirical study by Ferreira and Vilela (2004) as provided evidence that firms having larger investment opportunities are likely to face higher cost of cash shortage. Firm face such expected losses because of not availing the valuable (profitable) investment. In this context, one can predict a positive impact of firm investment on cash

reserves. Ferreira and Vilela (2004) also argued that firms those have more investment opportunities are likely to face higher financing distress cost as they are more likely to finance their projects through external financing. In such cases, firms that invest more may have larger amounts of cash to avoid such financial distress.

Given the above discussion one may project differences in cash holding behavior of firms across low and high-investment opportunities. Thus, it would be worth exploring the cash holding decisions of low and high-investment of firms. For this purpose we, following Denis and Sibilkove (2010) consider annual median value of net investment in year t as cut off point for high-investment and low-investment firms. Firms are ranked as high-investment if their net investment is greater than the median value of net investment of all firms included in the sample in year t. Specifically, we present our augmented model below.

$$\begin{aligned} CH_{i,t} = {} & (\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}) \times D_{i,t}^{hinv} \\ & + (\beta_8 CH_{i,t-1} + \beta_9 CF_{i,t-1} + \beta_{10} CFV_{i,t-1} + \beta_{11} SIZ_{i,t-1} + \beta_{12} LEV_{i,t-1} + \beta_{13} DIV_{i,t-1} + \beta_{14} TQ_{i,t-1}) \times D_{i,t}^{linv} \\ & + Y_t + V_i + \beta_0 + \delta D_{i,t}^{hinv} + \varepsilon_{i,t} \end{aligned} \quad (4)$$

In equation (4) $D_{i,t}^{hinv}$ is a dummy variable for high-investment firm and $D_{i,t}^{linv}$ is a low-investment dummy. We define $D_{i,t}^{hinv}$ as one for a firm in a year if the underlying firm's investment level in the given year is greater than the annual median value of firms' investment in that year and otherwise zero. Similarly, $D_{i,t}^{linv}$ is defined as equal to one for a year if the underlying firm's investment in that year is lower than the annual median

value of all firms' investment in the given year and otherwise zero. All the variables in equation (4) are already defined above in equation (1).

We opt this framework over estimation of the cash holdings equation separately for different categories of firms (financially constrained, unconstrained, high-growth, low-growth, high-investment and low-investment firms) because this enables us to systematically test the differences in behavior of cash holding decisions of firms for different types of firms.

3.3 Estimation Methods

In the literature, several different estimation methods are available to quantify the effects of firm characteristics on the cash holding decisions of firms such as, among others, Han and Qiu (2007) and Ozkan and Ozkan (2004), Uyar and Kuzey (2014), Bigelli and Sánchez-Vidal (2012) have used difference GMM estimator for their analysis. Although, the difference GMM estimator by Arellano-Bond is superior to various other estimates but it suffers with a problem of weak instruments. Therefore, following the Uyar and Kuzey (2014), we use the robust two-step system-GMM estimator proposed by Arellano and Bover (1995) and later on fully developed by Blundell and Bond (1998).[11]

We prefer this estimator based on several reasons. In finance literature, most of the studies have utilized firm-level panel data set. There are several different panel data estimators are available in the literature. Examples of these estimators are random effect estimator, fixed effect estimator, common effect estimator, difference estimator, GMM

[11] Although in two-step estimation method, the standard covariance matrix is already robust principally, this method yields standard errors that are downward biased. To overcome this, we apply Windmeijer's finite-sample correction, which yields the robust two-step covariance matrix (Windmeijer (2005)).

one-step estimator and two-step GMM estimator. These different estimators have their own merits and demerits. However, it is widely believed that the difference GMM estimator proposed by Arellano and Bond (1991) is one of the best estimators for the panel data having dynamic nature.[12]

The system-GMM estimation method effectively overcomes the problem of endogeneity and hetroskedasticity in the data. Further, it washed out the individual fixed effects while taking the difference of all underlying variable. No doubt, although the Arellano and Bond (1991) estimator is ranked above to many other panel data estimation techniques, it faces a problem of weak instruments. To solve this problem, Arellano and Bover (1995) proposed that for equations in levels, one should use the instruments in first difference and for equations in difference, one should use lagged values of the variables in their levels as the instruments.

However, it is argued that the version of Arellano and Bover (1995), which fully developed by Blundell and Bond (1998) is more efficient than the difference GMM estimator. System-GMM estimator will produce more efficient estimates than standard difference GMM estimator. This efficiency will be more pronounced for the case in which the coefficient of these lagged dependent variable. Approaches to one, this also holds true for the case when the variation in the time–invariant unobservable firm-specific factors is greater than the variability of the time varying residuals. Another important advantage of Blundell and Bond (1998) two-step system–GMM estimator is that it effectively overcomes the problem of the finite sample biased by using both the

[12] See, Blundell et al. (2001) for more on how system GMM estimator improves the poor performance of the standard GMM estimator.

lags of the variables in first differences and the lags of the variables in level as instruments.

Finally, the system GMM estimator is preferable as it combines level equation with first difference equations in order to avail all available moment conditions. Although, the system–GMM estimator takes into consideration heterogeneity across individual, this estimate maintains variability among individual firms by estimating the model in levels as well as in first difference. Despite of several advantages over other panel data estimators, the system GMM has some cavities. For example, in the literature researchers are not agreed on a well-established process, which can be used to select the set of instruments. Therefore utilization of instruments without prior information may cause the problem of too many instruments. The estimation is likely to suffer more from such problems if the underlying period is limited. It is commonly believe the two-step system–GMM method produces more efficient outcomes in comparison to the one-step system-GMM technique. Yet, this superiority is not always sure.

The validity of the system GMM estimation significantly relies on the quality of instruments utilized in the empirical analysis. Therefore, it is mandatory to check the suitability of used instruments. The robustness of instruments can be confirmed in the case when the estimated residuals don't show second order serial correlation. Since the model in dynamic nature, the presence of first order in the residual is very likely. However, it is necessarily to ensure whether the used instruments are valid or not and the residual of model should not be correlated at the second order.

In the literature, researchers have tested the validity of the instruments by applying different diagnostic tests. Further, it is also mandatory to examine the presence of the second order autocorrelation in the residuals. Following previous studies, in our study, we therefore apply the Arellano and Bond (1991) test for AR (2) for testing the existence of serial correlation in the residuals. To ensure the validity of the instruments, we employ the J-test of Hansen (1982) to test the null hypothesis of the instruments are orthogonal to the residuals.

3.4 Data and Sample

3.4.1 Sample Construction and Definition of Variables

To examine the cash holding decisions of firms, we construct an unbalanced annual panel dataset for all manufacturing firms listed at Karachi Stock Exchange (KSE). The study covers the period 2000-2012. Our sample includes all firms for which the data are available for at least three consecutive years. To overcome the problem of selection bias we allow entry and exit of the firms in our dataset. We abstract our dataset from 'Balance Sheet Analysis of Non-Financial Firms' (BSANFF) by State Bank of Pakistan (SBP). The BSANFF provides the information on selected items of balance sheet and income statement of the non-financial firms list at KSE. The data on stock prices of the firms included in the sample would be collected from data portal managed by KSE. Table 2 presents the definition an abbreviation of the variables we used in our empirical analysis. Table 2 also presents the expected relationship of each variable with the cash holdings of firms. We predict these relationships after reviewing prior empirical evidence and theoretical intuition of firm cash holdings.

Table 2: Definition and Abbreviation of Variables

Variables	Abbreviation	Expected Sign	Definition
Dependent Variable			
Cash Holdings	CH		Cash and short-term investments/book assets
Independent Variables			
Cash Flows	CF	+ve	Income before tax + depreciation/ book assets
Cash Flow Volatility	CFV	+ve	The standard deviation of the cash flow for each firm over the sample period
Tobin's Q	TQ	-ve	Market value of assets/book value of assets
Leverage	LEV	-ve	Total debt / book assets
Firm Size	SIZ	-ve/+ve	Natural logarithm of book assets
Payout Ratio	DIV	+ve	(Total dividend + purchase of common and preferred stock)/book assets
Variables used in construction of WW index			
Dividend Dummy	DD	-ve/+ve	1 for the firms pay dividend in that year and otherwise 0
Sales Growth	SG	-ve	First difference of log of total sales
Net Investment	Inv	+ve	(Capital expenditure – depreciation)/total book assets

Chapter 4

Empirical Results

4.1 Introduction

The previous chapter describes the empirical models, estimation methods, and our dataset. This chapter displays the empirical results. Specifically, this chapter first reports constraint type cross-classifications of firm-year observation, summary statistics and correlation matrix for full sample as well as for constrained and unconstrained corporations. Next, the results from the baseline model are presented. Then, the chapter displays the results of our main empirical model. Finally, the findings for high-growth and low-growth firms along with the results for high-investment and low-investment firms are presented in this chapter.

4.2 Cross-Classifications of Constraints Criteria

Table 3 presents the firm-year observations over the sample period under each of the three financial constraint schemes used to split firms into financially constrained and unconstrained types. According to the firm size scheme, 1518 firm-year observations are considered as financially constrained, while 2041 observation are classified as financially unconstrained. There are 1934 financially constrained firm-year observations according to payout scheme, whereas according to this scheme 1625 firm-year observation are financially unconstrained. According to our third criterion namely Whited and Wu index

1620 and 1939 firm-year observations are categorized as financially constrained and financially unconstrained observation, respectively.

It is also useful to know how all three-classification schemes provide a similar identification of financially constrained and financially unconstrained firms. Table 3 also presents this information. Specifically, the table provides the information regarding the degree at which the six financial constraint classifications are correlated with each other. The figures in the table provide evidence all three classification measures are positively correlated. For instance, out of the 1518 firm-year observation categorized as financially constrained firms according to the firm size criterion, 1009 firm-year observations are also classified as financially constrained firms according to the payout ratio criterion. Similarly, according to the Whites and Wu index 1133 firm-year observations out of 1518 firm-year observation considered financially constrained under the firms' size measure are also identified as financially constrained firms.

Table 3: Cross-Classification of Constraint Types

This table presents firm-year observations classified as either financially constrained or financially unconstrained according to different three measures we use in our analysis (firm size, payout ratio, and Whited and Wu index). Financially constrained firms are denoted by FCF, while financially unconstrained firms are denoted by FUCF. Our sample consists of non-financial firms listed at Karachi Stock Exchange. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The data are collected from Balance Sheet Analysis of Non-Financial Firm.

		Firm size		**Payout ratio**		**Whited and Wu**	
		FCF	**FUCF**	**FCF**	**FUCF**	**FCF**	**FUCF**
Firm size	**FCF**	1518					
	FUCF		2041				
Payout ratio	**FCF**	1009	925	1934			
	FUCF	509	1116		1625		
Whited and Wu	**FCF**	1133	806	1402	532	1620	
	FUCF	385	1235	427	1198		1939

There are 1235 firm-year observations that are commonly cataloged as financially unconstrained firms under both the firm size and WW index schemes. We also observe that there are 1402 firm-year financially constrained observations, which are classified by both Whited and Wu index and payout ratio scheme. Finally, there are 1198 firm-year observations that are categorized as financially constrained firms according to both payout ratio and WW index measures. We also observe some dissimilarity in classifications of firm-year observation across all the three schemes used to sort out financially constrained and unconstrained groups. For example, there are 509 firm-year observations that are ordered as financially unconstrained firms according to the payout criterion; however, these observations are considered financially constrained according to the firm size measure. Similarly, out of the 1518 size constrained firm-year observations, there are 385 firm-year observations classified as unconstrained according to the WW index.

In sum, we conclude that the firm-year observation classifications as constrained and unconstrained are highly positive but less than perfect correlated among all the three measures used to split the firm-year observation into financially constrained and unconstrained clusters.

4.3 Summary Statistics and Correlations

We calculate summary statistics to explore the distribution characteristics of the variables. Table 4 reports summary statistics for our whole sample period: 2000-2012. Specifically, the 2nd column of table presents mean of firm-specific variables, while the 3rd column displays the standard deviation (std.dev). Similarly, in the table, 25th (25th.p),

50th (median), and 75th (75th.p) percentiles are respectively presented in 4th, 5th, and 6thcolumn. Table 4 shows that the mean value of cash holding is 0.057, which is significantly greater than the median value. In particular, the median value of cash holding is 0.014. This implies that the firms' cash holdings are not symmetrically distributed. The average value of the cash flow volatility (CFV) is 0.481 across firm-years. The median value of the CFV is 0.080, which is significantly less than its mean value. This difference indicates that the cash flow volatility is positively skewed. The mean value of log of assets (firm size) is 6.950, while its standard deviation (std. dev) is 1.849. The median value of log of assets is 6.877, which is marginally below than the mean value of log assets. The values of 25th and 75thpercentile of log of assets are 5.842 and 8.067, respectively.

Table 4: Summary Statistics for Full Sample

This table shows summary statistics for full sample over the period 2000 to 2012. CH denotes the cash holding of firms, which are defined as cash plus short-term investments divided by the book value of total assets. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm.

Variables	Mean	Std. dev	25th.p	Median	75th.p
CH	0.057	0.109	0.004	0.014	0.055
CF	0.086	0.633	0.001	0.062	0.139
CFV	0.481	9.480	0.054	0.080	0.116
SIZ	6.950	1.849	5.842	6.877	8.067
LEV	0.290	0.225	0.092	0.267	0.446
DIV	0.043	0.071	0.011	0.025	0.053
TQ	1.231	1.336	0.753	0.924	1.232

These values suggest that the assets of firms included in our sample are roughly normally distributed. The mean value of leverage indicates that firms have debt about 29%of their assets. The standard deviation of leverage ratio is 0.225. We also observe the median value of the leverage, which is 0.267, is slightly lower than the mean value of leverage. However, there is a significant difference between the value of 25^{th} and 75^{th} percentile. This indicates that our sample includes both the low-levered and high-levered firms. The summary statistics regarding dividend ratio indicates the average value of cash dividend to total asset is 0.043, while its standard deviation is 0.071. The median value of payout ratio is 0.025 while 25^{th} and 75^{th} percentile values are 0.011 and 0.053, respectively. The difference between mean and median value suggests that distribution of payout ratio, across sampled firms, is positively skewed.

Firms including in our sample have considerable growth opportunities as the mean of Tobin's Q is 1.231. The mean value of Tobin's Q is considerably higher than the median value of Tobin's Q (0.924). This is an indication of negatively skewed market to book value. The standard deviation of cash flows suggests that the variation in cash flows of firms is notably greater than the variability of cash holdings of firms. When we compare standard deviation of all variables, we observe that cash flow volatility is more variable as compare to all other variables. Further, the standard deviation value indicates the log of assets is more volatile in comparison of other firm cash assets.

Summary statistics presented in Table 4 does not allow us to observe differences in firm characteristics across financially constrained and unconstrained firms. However, observing differences in characteristics of financially constrained and financially unconstrained firms is useful as the fundamental objective of our study is to examine the

differential impacts of firm-specific factors on cash holdings of financially constrained and financially unconstrained firms. Therefore, in Table 5, we present summary statistics separately for financially constrained and financially unconstrained firms. In particular, we estimate mean and standard deviation value of all the variables for financially constrained and financially unconstrained firms sorted based on the firm size, payout ratio, and Whited and Wu index. The estimates of the mean provide fascinating and preliminary evidence of different amounts of cash holdings by both types of firms. It is also emerging from the table that both types of firms are also significant difference in terms of their cash flow, leverage and Tobin's Q. Specifically, we observe financially constrained firms keep more cash, on average. In particular, we find that on average financially constrained firms hold cash 6.8% of their total assets. Yet, this figure for FUCF is only 4.5% of total assets. This implies that financially constrained firms, on average, significantly have higher amounts of cash holdings. This observation is consistent with several studies in the literature including Duchin (2010), Han and Qiu (2007), and Almeida et al. (2004) that observe that financially constrained firms significantly hold more cash balances.

Table 5: Summary Statistics across Financially Constrained and Unconstrained Firms

This table presents mean and standard deviation (Std. Dev.) of the variables for financially constrained and unconstrained categories of firms. We flag financially constrained firms (FCF) and financially unconstrained firms (FUCF) according to three different financial constraint measures, namely, firm size, payout ratio, and Whited and Wu (WW) index. CH denotes the cash holdings of firms, which are defined as cash plus short-term investments divided by the book value of total assets. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm.

Variables		Firm size		Payout ratio		Whited and Wu	
		FCF	FUCF	FCF	FUCF	FCF	FUCF
CH	Mean	0.068	0.045	0.086	0.036	0.089	0.049
	Std. Dev.	0.117	0.099	0.127	0.088	0.135	0.101
CF	Mean	0.094	0.078	0.034	0.161	0.072	0.146
	Std. Dev.	0.139	0.883	0.811	0.124	0.351	1.290
CFV	Mean	0.386	0.085	0.750	0.091	0.564	0.105
	Std. Dev.	3.484	0.062	2.32	0.260	1.480	0.383
SIZ	Mean	5.540	8.365	6.515	7.585	6.748	7.876
	Std. Dev.	1.196	1.190	1.857	1.643	1.869	1.422
LEV	Mean	0.304	0.261	0.324	0.234	0.371	0.174
	Std. Dev.	0.210	0.251	0.234	0.197	0.231	0.157
DIV	Mean	0.013	0.021	0.000	0.042	0.016	0.023
	Std. Dev.	0.041	0.042	0.000	0.056	0.040	0.050
TQ	Mean	1.059	1.402	1.296	1.135	1.241	1.838
	Std. Dev.	0.877	1.655	1.495	1.056	1.376	1.133

It is also interesting to note that the cash reserves of FCF are significantly more volatile as compared to the cash holdings of their FUC counterparts. These observations are consistent across different proxies used to identify financially constrained and unconstrained firms.

The mean and standard deviation of underlying firm-specific variables for high-growth and low-growth firms, high-investment and low-investment firms are given in

Table 5. We observe that on average, high-growth firms are expected to hold more amounts of cash than low-growth firms do. Specifically, the mean value of cash ratio is 6.8% for high-growth firms, while the responding figure for low-growth firms is only 4.6%. Do comparison of standard deviation of the cash ratio across low-growth firms and high-growth firms, we observe that cash holding of high-growth firms is more volatile as compared to cash reserves of low-growth firms. These observations confirm our hypothesis. Further these facts are consistent with the studies such as, Kalcheva and Lins (2003), Saddour (2006), and Azmat (2009).

When we turn to compare the mean value of other firm-specific variables of high-growth firms to the mean value of the variables of low-growth firms, we see that on average the mean value of cash flows and Tobin's Q is higher for high-growth firms than that of low-growth firms. We also find cash flow volatility on average is higher for high-growth firms in comparison to their low-growth counterparts. On the other hand the summary statistics indicates low-growth firms are, on average, large in size as compared to high-growth firms, this observation also in accordance with our expectations. The mean value of debt to total asset ratio, which is 28% of total assets of high-growth firms, is marginally lower than the mean of leverage of low-growth firms (29%). However, leverage of high-growth firms is more volatile in comparison to leverage of low-growth firms. This evidence is line with the view that the firms that are large and mature firms have good reputation in the external capital market and thus, they are likely to be less risky. Thus, they use more debt in their capital structure. Finally, we find that high-growth firms payoff, on average, small amount of dividends to their shareholders than

low-growth firms do. In particular, the average value of dividend ratio is 1.3% of their total assets for high-growth firms, while this figure is 2.2% for low-growth firms.

Table 6: Summary Statistics of Growth and Investment Firms

This table displays the mean and standard deviation (std.dev) of the variables for high-growth firms (HGF) and low-growth firms (LGF). The table also presents these statistics for high-investment firms (HIF) and low-investment firms (LIF). We separate the firms into high-growth and low-growth firms based on Tobin's Q. We use net investment expenditure to split firms into high-investment firms and low-investment firms. CH denotes the cash holdings of firms, which are defined as cash plus short-term investments divided by the book value of total assets. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows (CFV) is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm.

Variables		Growth firms		Investments	
		HGF	LGF	HIF	LIF
CH	Mean	0.068	0.046	0.061	0.056
	Std. Dev.	0.125	0.089	0.100	0.110
CF	Mean	0.092	0.078	0.101	0.083
	Std. Dev.	0.139	0.883	0.181	0.668
CFV	Mean	0.093	0.086	0.094	0.529
	Std. Dev.	1.321	0.745	0.091	0.163
SIZ	Mean	6.766	7.134	7.093	6.932
	Std. Dev.	2.081	1.562	1.571	1.881
LEV	Mean	0.281	0.296	0.292	0.161
	Std. Dev.	0.262	0.194	0.225	0.168
DIV	Mean	0.013	0.022	0.017	0.024
	Std. Dev.	0.028	0.052	0.042	0.040
TQ	Mean	1.749	0.713	1.249	1.082
	Std. Dev.	0.734	0.166	1.388	0.811

When we turn to compare the mean value of the variables of high-investment and low-investment firms, we find that on average, there are significant differences in firm characteristics across both groups of firms. For instance, the mean value of the cash to asset ratio of high-investment firms is 6.1%, whereas the mean value of cash to asset ratio

of low-investment firms is 5.6%. This indicates that on average, the firms those do more investment are usually to hold more cash reserves. Firm may do so in order to finance their potential future investment. However, one should note that the variation of cash to assets ratio is similar for both groups of firms. High-investment firms have, on average, more debt outstanding than low-investment firms. Specifically, we find that the mean of high-investment firms' leverage is about 29%. In contrast to this, the mean value of leverage of low-investment firms is only 16%. The leverage of high-investment firms is also more valuable as compared to the leverage of low-investment firms.

The difference in leverage of low and high-investment firms suggests that the firms who do more investment are more likely to finance their investment through bank borrowing. It should also be noted that high-investment firms on average are large in size than low-investment firms. Consistent with our hypothesis, we observe that high-investment firms, the firm that do more investment, have, on average, higher cash flows than low-investment firms. Specifically, the mean of cash flows of high-investment firms is 10% of their assets. Whereas, the mean value of the cash flows of low-investment firms is about 8% of their assets.

Another striking observation is that the mean value of cash flow volatility of firms that do more invest is 0.094. Whereas, the average volatility of cash flow of low-investment firms is 0.529. This significant difference between the average value of the cash flow volatility across both types of firms suggest that firms those cash flows are relatively consistent are likely to do more investment expenditure. This observation is consistent with the notion that firms that have low variation in their earnings are likely to be less risky and to have more internally generated fund as well as can easily raise capital

through internal resources to finance their investment. They, therefore, are likely to do more investment. The mean value of Tobin's Q indicates that on average high-investment firms has higher market to book value as compare to firm those do less investment expenditures. Finally, we find that high-investment firms are less likely to pay more amounts of dividends than low-investment firms pay.

To get the preliminary evidence on the relationship between firm-specific variables, we display correlation estimates in Table 7. The table also shows the p-value. We estimate correlation coefficient in order to test whether the correlation estimates are significantly different from zero for full sample as well as for financially constrained firms and financially unconstrained firms, separately. We find that correlation estimates are consistent with our hypotheses. Specifically, the current level of cash reserves is positively correlated with one period past amount of cash reserves. This observation implies that those firms that hold excess amounts of cash in current periods are expected to keep more amounts of cash in the future as well. The correlation between cash holdings and firms' cash flows is also positive for full sample. This finding is also consistent with our expectation.

This correlation also appears statistical significant at better than the 1% level. The positive correlation suggests that the cash flows of firms are positively related with cash holdings of firms. That is, firms those cash flows are higher are likely to their cash balances. The sign of correlation between cash holdings and the cash flow volatility for full sample is negative. However, the estimate is not statistically different from zero. We also observe from the table, size of firm is positively correlated with the cash holding behavior of firms. This correlation is also statistically significant. The positive correlation

between firm size and cash holdings suggests that larger firms increase their cash holdings with size. This is also consistent with the literature that reports a positive association between firm size and cash holding decisions of firms.

Table 7: Correlation Estimates for Financially Constrained and Unconstrained Firms

This table presents the pair-wise (Pearson) correlation coefficients between cash and independent variables for full sample as well as for financially constrained and unconstrained categories of firms. The values given in parentheses are p-values to test whether the correlation estimate is different from zero. We flag financially constrained firms (FCF) and financially unconstrained firms (FUCF) according to three different financial constraint measures, namely, firm size, payout ratio, and Whited and Wu (WW) index. CH denotes the cash holdings of firms, which are defined as cash plus short-term investments divided by the book value of total assets. LCH is the one-period lagged value of cash holdings. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows (CFV) is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm.

Variables	Full sample	Firm size		Payout ratio		WW index	
		FCF	FUCF	FCF	FUCF	FCF	FUCF
LCH	0.777	0.800	0.759	0.752	0.777	0.756	0.781
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CF	0.058	0.031	0.313	0.013	0.304	0.006	0.125
	(0.000)	(0.125)	(0.000)	(0.504)	(0.000)	(0.845)	(0.000)
CFV	-0.016	-0.019	0.006	-0.014	0.003	-0.035	-0.016
	(0.264)	(0.371)	(0.774)	(0.471)	(0.893)	(0.262)	(0.325)
SIZ	0.081	-0.215	0.173	-0.094	0.148	0.287	-0.005
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.767)
LEV	-0.309	-0.255	-0.359	-0.195	-0.405	-0.268	-0.325
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DIV	0.273	0.195	0.324	0.201	0.248	0.175	0.310
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TQ	0.176	0.260	0.118	0.248	0.138	0.220	0.056
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.100)	(0.000)

The correlation estimate between leverage and cash holdings is negative. This means that firms that have more debt to total asset ratio also have more cash. This positive correlation is not consistent with the view that firms decrease their cash handling with an increase in leverage. The correlation coefficient of the market to book value of

total asset is positive and statistically significant, suggesting firms having more the market to book value hold more amounts of cash.

When we turn to observe the correlation estimates for financially constrained and unconstrained firms we observe some significant difference in terms of both sign and statistical significance. These differences hold across different proxies used to classify firms into financially constrained and unconstrained firms. The current value of cash is significantly positively related with the previous period cash holdings for both firms constrained and unconstrained firms. We can observe from the table the magnitude of the correlation between current and previous period cash holding is approximately similar for both groups firms. This correlation is also statistically significant for both financially constrained and unconstrained firms.

The correlation between the cash flows and cash holdings is not only large in size but also only statistically significant for financially unconstrained firms. Specifically, the correlation estimate is 0.031 for financially constrained firms, while it is 0.313 for financially unconstrained firms when firms are sorted out based on firm size. This observation is also robust for other two proxies we use to sort out firms into financially constrained and unconstrained clusters. The correlation between cash flow volatility and cash holding is negative for constrained firms, while the correlation is positive for firms that are not financially constrained. However, it appears statistically insignificant regardless of the type of firms.

Firm size is also differently correlated with cash holdings across financially constrained and unconstrained firms. Specifically, the correlation between firm size and

cash holding is negative for financially constrained firms, whereas, it is positive for financially unconstrained firms. For both groups, this correlation is statistically different from zero. This finding is similar for different proxies used to categorize financially constrained and unconstrained firms. Leverage is negatively correlated with cash holdings for both groups of firms. However, the coefficient of correlation for financially unconstrained firms is larger than for financially constrained firms. Payout ratio is positively correlated with cash holdings with cash holdings for both financially constrained and unconstrained firms. However, payout ratio is strongly related to cash holdings of firms for financially constrained firms as compared to financially unconstrained firms.

Finally, we find that for financially constrained firms, the correlation between the Tobin's Q and the cash holdings of firms is higher than financially unconstrained firms. This observation holds for different proxies used for sorting out firms. In sum, correlation estimates provide some initial information concerning the relationship between firm characteristics and the cash holdings of financially constrained *versus* unconstrained firms. However, to examine this relationship formally, we estimate several empirical models where other firm-specific factors that may have effects on cash holdings are also present.

To obtain the initial evidence on the response of cash holdings to firm-specific determinants across high-growth and low-growth firms as well as high-investment and low-investment firms. The correlation estimates presented in Table 8 provide evidence of different response of cash holdings to firm-specific factors. For instance, the correlation between the current value of cash holdings and the previous amount of cash holdings is

higher for high-growth firms as compared to low-growth firms. Specifically, the correlation estimate for high-growth is 82%, while this figure for low-growth firm is about 71%. For both group of firms, this correlation is statistically different from zero.

Table 8: Correlation Estimates

This table presents the pair-wise (Pearson) correlation coefficients between cash and independent variables for high-growth firms and low-growth firms as well as for high-investment and low-investment firms. The values given in parentheses are p-values to test whether the correlation estimate is different from zero. We separate the firms into high-growth firms (HGF) and low-growth firms (LGF) based on Tobin's Q. We use net investment expenditure to split firms into high-investment firms (HIF) and low-investment firms (LIF). CH denotes the cash holdings of firms, which are defined as cash plus short-term investments divided by the book value of total assets. LCH is the one-period lagged value of cash holdings. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm.

Variables	Growth Firms		Investment Firms	
	HGF	LGF	HIF	LIF
LCH	0.816	0.715	0.777	0.678
	(0.000)	(0.000)	(0.000)	(0.000)
CF	0.054	0.134	0.053	0.263
	(0.008)	(0.000)	(0.001)	(0.000)
CFV	-0.026	-0.027	-0.017	-0.056
	(0.216)	(0.187)	(0.276)	(0.194)
SIZ	0.113	0.051	0.065	0.236
	(0.000)	(0.000)	(0.000)	(0.767)
LEV	-0.353	-0.239	-0.311	-0.394
	(0.000)	(0.000)	(0.000)	(0.019)
DIV	0.271	0.257	0.267	0.326
	(0.000)	(0.000)	(0.000)	(0.000)
TQ	0.191	-0.122	0.190	0.040
	(0.000)	(0.000)	(0.000)	(0.917)

Similarly, cash flow is more correlated to cash holdings of firms for low-growth firms as compare to high-growth firms. For high-growth firms, the correlation between

cash and cash flows is about 5%, while, it is about 13% for low-growth firms. For both groups of firms, the correlation is negative. However, it is insignificant statistically. Size is positively correlated with cash holdings of firms for both high-growth and low-growth firms. However, the estimates of correlation are significantly larger for high-growth firms. We observe that the size of correlation coefficient between leverage and cash holdings is different for high-growth and low-growth firms.

In particular, we find that the estimate for high-growth firms is only about 24%. Both estimates are statistically different from zero. For both high and low-growth firms payout ratio is positively related to their cash-holdings decisions. However, the correlation is slightly higher for high-growth firms. It is about 27% for high-growth firms, whereas, it is 26% for low-growth firms. Finally, we find that the correlation between Tobin's Q cash is positive for high-growth firms, while it is negative for low-growth firms.

When we turn to compare the correlation estimates across high-investment and low-investment firms, we also observe significant differences. For example, the correlation between current and past amounts of cash holding is about 78% for high-investment firms, while it is about 68% for low-investment firms. Both estimates are statistically different from zero. Consistent with high-growth and low-growth firms, we find that cash flows of firms are more strongly correlated with their cash holdings for low-investment firms in comparison of high-investment firms.

The correlation between cash flow volatility and cash holding is negative for both groups of firms. But once again, it appears statistically insignificant. Leverage is

negatively correlated to cash holdings for both low-investment and high-investment firms. However, the correlation coefficient is large for high-investment firms. The correlation between payout ratios is also stronger for low-investment firms as compared to high-investment firms. Specifically, the correlation coefficient estimate is about 33% for low-investment firms while it is about 27% for high-investment firms. However, both are statistically different from zero.

Finally, Tobin's Q has a positive correlation with cash holdings across high-investment and low-investment firms. However, the magnitude of correlation is significantly high for high-investment firms than low-investment firms. For low-investment firms, although the magnitude is positive but it is statistically not different from zero. These correlations provide some preliminary evidence on the differential response of cash holdings to its determinants across low-investment and high-investment firms and across low and high-growth firms.

4.4 Estimation Results

4.4.1 The Results from the Baseline Model

The central objective of this thesis is to study the differential response of firm cash holdings to its determinants across financially constrained and unconstrained firms. The study also aims to investigate whether high-growth firms hold different amounts of cash as compared to their low-growth counterparts. Finally, the study also examines the role of firms' investment levels in firms' cash-holding decisions. However, we begin our regression analysis by estimating equation (1). We estimate the baseline model to

compare our results with those studies that do not consider the differential impacts of firms-specific variables on cash holding behavior of firms. We implement the robust two-step system GMM estimator to estimate the baseline regression. Table 9 presents the results.

As we know the soundness of the GMM estimation critically relies on the validity of the instruments applied in the estimation process. Therefore, we apply the J-statistics of Hanson (1982). The J-test follows the chi-square distribution with the degree of freedom equals to the number of over identifying instructions. Specifically, this test is used to test whether the instruments are orthogonal to the residuals. For validity of the instruments, the residuals also should be free from the 2^{nd} order autocorrelation. Therefore, to scrutinize the presence of autocorrelation in the model, we apply AR(2) test developed by Arellano and Bond (1991). Under the null hypothesis of the absence of autocorrelation this test follows the normal distribution.

Panel B in the table presents the results of these two tests. These results reveal that our instruments are robust. Specifically, the estimates of J-test provide evidence of not rejecting the null hypothesis that the instruments are orthogonal to the residuals. Specifically, we find that the p-value associated with this statistics is 0.661, which is considerably greater than any expectable level of significance. Similarly, we do not find any significant evidence of the presence of autocorrelation in the baseline model. These diagnostic tests provide evidence that the instruments are valid.

When we observe the results of determinants of cash levels we find that the results are not only in accordance with our hypothesis but also are consistent with previous empirical studies. The results given in the table suggest that firms' cash holdings are

Table 9: Determinants of Cash Holdings: The Baseline Model

This table presents the results of our baseline model. We use the robust two-step system-GMM estimator to estimate the model. Specifically, we estimate the following model for quantifying the effects of the empirical determinants of corporate cash holdings.

$$CH_{i,t} = \beta_0 + \beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1} + Y_t + V_i + \varepsilon_{i,t}$$

Where CH denotes the cash holdings of firm *i* for time *t*, which are defined as cash plus short-term investments divided by the book value of total assets. The one-period lagged value of cash holdings is also included in the regression as an independent variable in order to control for the dynamic of cash holdings. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows (CFV) is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. Year dummies (Y) are also included to control for year-specific fixed effects. V denotes individual firm-specific fixed effects. ε is the error term. Information regarding firm-year observations, total number of firms, diagnostic tests, and their p-values are given in Panel B of the table. The J-statistic is the Hansen (1982) test for testing the orthogonality condition for the instruments used in the estimation. The AR(2) is the Arellano-Bond (1991) test for testing the presence of second order autocorrelation in the residuals. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm. *** denotes the significance at the 1% level of significance.

Panel A: Estimation Results		
Variables	Coefficient	Std. Error
$CH_{i,t-1}$	0.408***	0.001
$CF_{i,t-1}$	0.085***	0.004
$CFV_{i,t-1}$	0.083***	0.005
$SIZ_{i,t-1}$	-0.002***	0.000
$LEV_{i,t-1}$	-0.060***	0.002
$DIV_{i,t-1}$	0.079***	0.007
$TQ_{i,t-1}$	0.012***	0.000
Constant	0.053***	0.003
Panel B: Diagnostic Tests		
Firm-years	3559	
Firm	451	
AR(2)	-0.44	
p-value	0.661	
J-statistic	202.30	
p-value	0.481	

positively and significantly related to one period lagged cash holdings. Specifically, we find that the estimated coefficient of lagged of cash holdings is positive, providing evidence of the persistence of cash holdings. This implies that those firms hold more cash previously continue to hold larger amount of cash.

Inspecting the coefficients of cash flows we find that cash holdings of firms increase significantly with cash flows. In particular, we find that the coefficient of cash flows is 0.085, which is significantly different from zero. This result is also consistent with previous empirical studies that have also documented a positive association of cash flows with cash holdings of firms. These studies are, among others, Opler et al. (1999), Almeida et al. (2004), Ozkan and Ozkan (2004), and Ferreira and Vilela (2004), Han and Qiu (2007), Harford et al. (2008), Rizwan and Javed (2011), Gill and Shah (2012), Gao et al. (2013), and Uyar and Kuzey (2014), The positive impact of cash holdings that we present here also supports the prediction of the pecking order theory. According to this theory, firms increase their holding of cash when they have large cash flows. However, one should note that our this finding is contrary to the findings of Duchin (2010), Bates et al. (2009), Chen (2008) and Guney et al. (2007) that find the negative impact of cash flows on cash hoardings. The negative impact of cash flows on cash is also not consistent with the prediction of the trade-off theory, which predicts a negative relationship between cash flows and cash levels.

The coefficient of the cash flow volatility is positive and statistically significant. This implies that firms with high variations in their cash flow streams increase their cash balances. This finding is consistent with the literature that provides evidence of the positive impact of the cash flow volatility (Saddour (2006), Gao et al. (2013), and Han

and Qiu (2007)). On the other hand, studies, such as Ferreira and Vilela (2004) and Uyar and Kuzey (2014), show that firms with more volatile cash flows decrease their cash holdings. Thus, our finding does not support the findings of these studies. Our results also suggest that larger firms are likely to hold less cash in their hands. In particular, the coefficient of firm size is negative and significant with the magnitude of -0.002.

Several studies in the literature such as, Opler et al. (1999), Almeida et al. (2004), Ferreira and Vilela (2004), Ozkan and Ozkan (2004), Saddour (2006), Han and Qiu (2007), Bates et al. (2009), and Duchin (2010), have also reported the negative relation of firm size with the cash holding behavior of firms. Further, the negative impact of size supports the prediction of the trade-off theory. In particular, the trade-off theory predicts that firms increase their cash holdings with their size.

Consistent with previous studies, we show that the leverage is negatively related to cash. This suggests that firms with more debt obligations hold low amounts of cash. Our this finding confirms the findings of Opler et al. (1999), Ozkan and Ozkan (2004), Uyar and Kuzey (2014), Harford et al. (2008), Dittmar and smith (2007), and Guney et al. (2007). These studies have also provided evidence of the inverse association between leverage and cash stocks. Both the pecking order and the agency cost theory also predict negative effects of leverage. In contrast to most of the previous empirical studies that show that firms decrease their cash balances when they pay cash dividends (see, for example, Opler et al. (1999), Gao et al. (2013), and Kim et al. (2011)), we find that dividend payments exert positive impacts on firms' cash-holding policy. This indicates that firms increase their cash holdings with their dividend payments. This finding confirms the findings of earlier empirical studies that have been shown the positive

relation of cash holdings with dividend payments. Examples of these studies are Bates et al. (2009) and Bigelli and Sánchez-Vidal (2012).

Consistent with the empirical studies by Opler et al. (1999) for the USA, Ozkan and Ozkan (2004) for the UK, Chen (2008), Al-Najjar and Belghitar (2011), Ferreira and Vilela (2004), Duchin (2010) for the USA, and Almeida et al. (2004) for the USA, and economic theories, namely the pecking order and the trade-off, we show the positive impact of Tobin's Q on cash. This finding is also line with our prior that firms having more market to book value also build excess cash balances. A possible explanation of this is that firm with higher Tobin's Q have more growth opportunities and thus, they mount up cash for funding all valuable investments.

On the whole, the results from the baseline model suggest that two prominent theories of finance, namely the pecking order theory and the trade-off theory, are important in explaining the cash holding structure of listed firms operation in Pakistan. Further, our findings are also consistent with several prior empirical studies that have been done for different countries across the globe.

4.4.2 Financial Constraints and Effects of Cash Determinants

The results of baseline model provide significant evidence on the role of firms-specific determinants of cash holdings in explaining the cash holding decisions of the firms. Yet, these results do not allow us to infer whether financial constraints matter in explaining determinants of firm cash holding behavior. However, it is very likely that financially constrained firms' cash holdings respond differently to firm-specific determinants

compare to financially unconstrained firms. Therefore, to explore this possibility, we present another set of results in the following section, which allow us to observe differential impact of firm-specific factors on cash balances of firms across financially constrained *versus* unconstrained firms.

To investigate the asymmetric effects of firm-specific factors on firms' cash holdings decisions across financially constrained and unconstrained firms, we estimate the equation (2). Following prior literature, we utilize three different constraints measures to identify financially constrained and unconstrained firms. These measures are: (1) the firm size, (2) the payout ratio, and (3) the Whited and Wu index. We use different three measures to ensure that the results we present in this dissertation are robust to different financial constraints identifiers.

Table 10 presents the results of all three measures used in our study. When we observe the results we notice some important differences in response of firms' cash holdings to its determinants across financially constrained and unconstrained firms. We also perceive that the differential response of cash holdings holds for all three used constraints criteria.

Before discussing our main results it would be useful to do commentary on the diagnostic tests. We apply J-test and the Arellano-Bond AR (2) test to check the robustness of our estimation. Specially, the Arellano and Bond test is used to ensure that the residuals of the model are free from the problem of second order serial correlation. We apply J-test to ensure that the instruments we use in our estimation are not correlated with the residuals.

Panel B in Table 10 reports the results of diagnostic tests. This panel also reports the firm-year observations and total number of firms in our sample. The p-value associated with AR (2) test provides evidence of the absence of serial correlation in the errors. This finding holds for all three models presented in the table. Specifically, we find that p-value is 0.489, 0.062, and 0.406 for Model 1, Model 2, and Model 3, respectively. These p-values indicate that we are unable to reject the null hypothesis of the absence of autocorrelation. The p-values associated with J-statistics are 0.876, 0.823, and 0.453 for Model 1, Model 2, and Model 3, respectively, suggesting that we cannot reject the null hypothesis of the instruments are orthogonal to the residuals. This implies that our instruments are valid and they are uncorrelated with the errors. In sum, the results from the diagnostic test confirm the validity of our instruments and provide the evidence of robustness of our results. Therefore, when we interpret the effects of cash holdings determinants on the behavior of firms we do not further comment on the instruments.

First, we first interpret the results based on the firm size measure. Consistent with the summary statistics we present in Table 10 we find that the financial constraints dummy has a positive coefficient, indicating that on average, those firms have limited excess to external capital markets hold more amounts of cash as compared to those have ease excess. This finding is also in line with the previous studies that argued that firms increase their cash holdings when they face difficulties in obtaining funds from external resources. When we inspect the impact firms-specific variables on the cash holding behavior of firms we find that the effect of one period lagged cash holding is positive and statistically significant for both categories of firms.

Table 10: Differential Effects of Determinants of Cash Holdings across Financially Constrained and Unconstrained Firms

This table presents the results for the empirical determinants of cash holdings for financially constrained *versus* unconstrained firms. We use the robust two-step system-GMM estimator to estimate the model. Specifically, we estimate the following model for quantifying the differential effects of the empirical determinants of corporate cash holdings.

$$\begin{aligned} CH_{i,t} = {} & \left(\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}\right) \times D_{i,t}^{fcon} \\ & + \left(\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}\right) \times D_{i,t}^{funcon} \\ & + Y_t + V_i + \beta_0 + \delta D_{i,t}^{fcon} + \varepsilon_{i,t} \end{aligned}$$

where CH denotes the cash holdings of firm i for time t, which are defined as cash plus short-term investments divided by the book value of total assets. The one-period lagged value of cash holdings is also included in the regression as an independent variable in order to control for the dynamic of cash holdings. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows (CFV) is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. Year dummies (Y) are also included to control for year-specific fixed effects. V denotes individual firm-specific fixed effects. ε is the error term. $D_{i,t}^{fcon}$ is a dummy for financially constrained firms. It takes value one in year t if the firm is categorized as financially constraint in the corresponding year and otherwise zero. $D_{i,t}^{funcon}$ is a dummy for financially unconstrained firms. It takes value one for year t if the firm is categorized as financially unconstraint in the corresponding year and otherwise zero. We flag financially constrained firms (FCF) and financially unconstrained firms (FUCF) according to three different financial constraint measures, namely, firm size, payout ratio, and Whited and Wu (WW) index. Information regarding firm-year observations, total number of firms, diagnostic tests, and their p-values are given in Panel B of the table. The J-statistic is the Hansen (1982) test for testing the orthogonality condition for the instruments used in the estimation. The AR(2) is the Arellano-Bond (1991) test for testing the presence of second order autocorrelation in the residuals. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm. ***and ** denote the significance at the 1% and 5% level of significance, respectively.

Panel A: Estimation Results

Variables	Firm Size		Payout Ratio		WW Index	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
$D_{i,t}^{fcon} \times CH_{i,t-1}$	0.275***	0.003	0.366***	0.017	0.316***	0.013
$D_{i,t}^{funcon} \times CH_{i,t-1}$	0.435***	0.007	0.474***	0.011	0.460***	0.016
$D_{i,t}^{fcon} \times CF_{i,t-1}$	0.126***	0.006	0.057***	0.010	0.102***	0.015
$D_{i,t}^{funcon} \times CF_{i,t-1}$	0.039***	0.004	0.040***	0.013	0.036***	0.006
$D_{i,t}^{fcon} \times CFV_{i,t-1}$	0.096***	0.005	0.019**	0.008	0.124***	0.027
$D_{i,t}^{funcon} \times CFV_{i,t-1}$	-0.159***	0.014	-0.138***	0.023	-0.073***	0.016
$D_{i,t}^{fcon} \times SIZ_{i,t-1}$	-0.035***	0.000	-0.003**	0.001	-0.009***	0.001
$D_{i,t}^{funcon} \times SIZ_{i,t-1}$	0.003***	0.000	0.006***	0.001	0.002***	0.000
$D_{i,t}^{fcon} \times LEV_{i,t-1}$	-0.032***	0.003	-0.024***	0.005	-0.096***	0.010
$D_{i,t}^{funcon} \times LEV_{i,t-1}$	-0.076***	0.002	-0.103***	0.009	-0.071***	0.007
$D_{i,t}^{fcon} \times DIV_{i,t-1}$	-0.080***	0.011	–	–	-0.269***	0.022
$D_{i,t}^{funcon} \times DIV_{i,t-1}$	0.280***	0.020	0.206***	0.035	0.499***	0.044
$D_{i,t}^{fcon} \times TQ_{i,t-1}$	0.031***	0.000	0.038***	0.002	0.015***	0.000
$D_{i,t}^{funcon} \times TQ_{i,t-1}$	0.005***	0.000	0.016***	0.002	0.010***	0.002
$D_{i,t}^{fcon}$	0.168***	0.007	0.176***	0.016	0.047***	0.009
Constant	0.045***	0.004	0.022***	0.010	0.058***	0.008
Panel B: Diagnostic Tests						
Firm-years	3559		3559		3559	
Firm	451		451		451	
AR(2)	-0.69		-0.50		-0.83	
p-value	0.489		0.62		0.406	
J-statistic	281.54		151.87		141.31	
p-value	0.876		0.823		0.453	

This provides evidence of the persistence in cash holding activities. That is, firms those hold more cash in the preceding period are also likely to hold more cash in their hands in the current period.

However, we observe that the estimated coefficients of lagged cash holdings for financially unconstrained firms are greater than that of financially constrained firms. This piece of evidence suggests that financially unconstrained firms adjust their cash holdings towards their target cash levels more quickly than financially constrained firms, when they deviate from the targets. Our this finding is consistent with Han and Qiu (2007), who also show higher persistence in hoarding of cash for financially constrained firms, when they use dividend payout ratio as a measure to classify firms into financially constrained and unconstrained firms. However, they report the opposite when they use others financial constraint criteria, such as, firm size, bond rating, and commercial paper ratings as constraints identifiers.

Examining the response of cash holdings of firms to cash flows we see that both groups of firms increase cash holdings with cash flows. Specifically, the coefficient of cash flows for financially constrained firms is 0.126, whereas, for financially unconstrained firms, it is only 0.039. These estimates suggest that although both types of firms' cash holdings are positively correlated with their cash flows, this relationship is significantly stronger for financially constrained firms. The cash holdings of financially constrained firms would increase by 0.126 (12.6% of total assets) units in response of an increase of 1 unit of cash flows to asset ratio. Yet, the cash holdings of financially unconstrained firms will increase by only 0.039 (about only 4% of total assets) units when cash flows increase by 1 unit.

The differential impacts on cash holdings of cash flows support the findings of the Han and Qiu (2007) when they classified financially constrained and unconstrained firms based on commercial paper rating. However, our finding is contrary to their findings when they use other financial constrained measures to identify financially constrained and unconstrained firms. One should also note that our empirical framework is significantly different from the one used by Han and Qiu (2007). We estimate the cash model where we interact all independent variables with financially constrained and unconstrained dummies, whereas, they estimate the regression for cash holdings on separate subsamples of financially constrained and unconstrained firms.

We also show that unexpected variations in cash flows have a positive impact on the cash balances of financially constrained firms but negative on the cash holdings of financially unconstrained firms. These findings reveal that on average, financially constrained firms increase their cash holdings when their cash flows are more volatile. However, on the opposite, financially unconstrained firms appear to decrease their cash reserves when they face variation in their cash flows. Han and Qiu (2007) also reported the negative impact of the cash flow volatility on the cash holding decisions of financially unconstrained firms. However, their finding was not statistically significant at any acceptable level of significance. The negative relationship between the cash flow volatility and cash holdings for financially unconstrained firms makes sense. Financially unconstrained firms decrease their cash holdings during periods when their cash flows are volatile as they can easily do external financing funds if they need capital for funding their investment. However, variations in cash flows make external finance further harder and expensive for financially constrained firms. Thus, they add more cash flow to their

cash reserves during periods of volatile cash flows. Another possible explanation is that variable cash flows increase the cost of financial distress for financially constrained firms. Financially constrained firms therefore increase their cash holdings when they are uncertain regarding their cash flows.

The estimated of coefficients of firm size suggest that the influence of firm size on the cash holding policy of firms is different for financially constrained *versus* financially unconstrained firms. Specifically, we find that the cash holdings of financially constrained firms are negatively related to their size while, the cash holdings of financially unconstrained firms are positively correlated to the firm size. This implies that financially constrained firms decrease their cash holdings with an increase in size. On the other side, their financially unconstrained counterparts do the reverse, increasing their cash holdings with size. The negative effect of firm size on cash levels is consistent with the previous empirical studies such as Duchin (2010), Almeida et al. (2004), and Han and Qiu (2007). However, the positive response of the cash holdings of financially unconstrained firms to their size is also consistent with some studies like Anjum and Malik (2013), Guney et al. (2007), Harford (1999), Ahsan and Ullah (2013), and Ogundipe et al. (2012) that have been documented the significant positive impact of firm size on cash holding decisions of firms.

A possible explanation for differential impact of firm size is that financially constrained firms face less severe financial constraints when they are large and thus, they are likely to hold less cash holdings. Financially unconstrained firms may increase their cash holdings, as they prefer to add their internally generated funds to their cash reserves while use external financing to fulfill their capital needs.

Consistent with several previous existing empirical studies in the literature we find evidence of a negative effect of leverage on cash. This finding is similar for both types of firms. This implies that regardless of whether firms face financial constraints or not they decrease their cash holdings when they increase debt in their capital structure. Examples of the studies that have also reported the negative relationship between leverage and cash holdings are Opler et al. (1999), Ozkan and Ozkan (2004), Uyar and Kuzey (2014), and Ferreira and Vilela (2004). However, our findings are not consistent with some studies such as Bates et al. (2009), Guney et al. (2007), Harford (1999), Ahsan and Ullah (2013), Han and Qiu (2007), and Ogundipe et al. (2012) that have shown the positive response of cash holdings to leverage.

The negative impact of leverage on cash holding that we present here for both types of firms is contradictory to the trade-off theory, which predicts the positive relationship between leverage and cash. However, our finding strongly supports the prediction of the pecking order theory and agency cost theory. Both of these theories predict that both leverage and cash are negatively related. As in Cyglayan et al. (2002) and Diamond (1984), if firms consider debt as a substitute of cash reserves, then even, according to the trade-off theory, the leverage would be negatively related to cash holdings. Firms with high debt levels reduce their cash amount as debt mitigates the moral hazard problem and is more flexible. On the other hand, as explained by Ferreira and Vilela (2004), if leverage is considered to be positively related to the likelihood of bankruptcy then there would be a positive association between leverage and cash reserves. That is, as leverage increase the chance of bankruptcy, firms with higher leverage ratio are likely to hold more cash. The negative impact of leverage on cash

holding is also in line with the free cash flow theory, which states that firms require less external monitoring when they are less levered. Thus, managers of these firms can create more managerial discretion, which results in accumulation of cash.

Although we show that there is a negative impact of leverage and cash holdings of both financially constrained and unconstrained firms, the extent at which both types of firms are affected in quite different. The magnitude of the estimated coefficients for financially unconstrained firms is -0.076, whereas, it is -0.032 for financially constrained firms. These figures imply that with an increase of 1 unit of debt to asset ratio (leverage) financially unconstrained and constrained firms reduce their cash to asset ratio (cash holdings) by 0.076 and 0.032 units, respectively. The greater response of the cash holdings of financially unconstrained to leverage is in line with our hypothesis. We have predicted that financially unconstrained firms can easily borrow from banks and use debt as substitute for cash.

When we observe the impact of dividend payments on cash holdings we find that dividends are also differently related to cash accumulation across financially constrained *versus* financially unconstrained firms. Specifically, the estimates of dividend payments indicate that financially constrained firms decrease their cash balances when they give dividends to their shareholders. Contrary to this, financially unconstrained firms increase their cash reserves with dividend payments Gill and Shah (2012), Harford et al. (2008), Dittmar and smith (2007), Opler et al. (1999), Gao et al. (2013), and Kim et al. (2011) document a negative impact of dividend payments on cash holdings of firms. However, studies including Bates et al. (2009) and Bigelli and Sánchez-Vidal (2012), show that dividends are positively associated with cash holdings.

The estimated coefficients on dividend payments suggest that the positive influence of dividend payments on cash holdings of financially unconstrained firms is greater, in absolute term, then the negative impact of dividends on cash stocks of financially constrained firms. The negative impact of payout ratio is consistent with the notion that the dividend paying firms are expected to raise funds relatively easily by reducing their dividend payments when they need funds. In this context, firms' dividend policy has a negative impact on their cash holdings (Ozkan and Ozkan (2004) and Opler et al. (1999)). The positive influence on cash holdings of dividend payout ratios for financially unconstrained firms can be explained as follows. Dividend-paying firms increase their cash balances more than the firms those do not pay dividend. Such firms may hold extra cash simply for payments of dividends to their shareholders. In this situation, there is a positive association between the firm's dividend policy and its cash holdings when it faces a shortfall in cash.

Regarding the impact of Tobin's Q on cash holdings we observe significant and positive coefficients for constrained as well as unconstrained firms. This implies that firms with higher value of Tobin's Q are likely to hold more cash. The positive response of cash holdings to Tobin's Q is rationalized in manner of the trade-off theory as well as the pecking order theory. According to the trade-off model, firms those have relatively more investment opportunities may incur higher cost in obtaining funds from external resources because of higher cost of financial distress and being under investment. Thus, in order to mitigate the cost associated with financial distress, such firms are likely to keep more amounts of cash as precautionary measures. This suggests that firms' growth opportunities would be positively related to cash levels. Likewise, according to the

pecking order theory, growth opportunities are also positively related to cash stocks. However, this relationship is indirect. Firms having higher growth opportunities are principally considered more profitable. Higher levels of profit make them enable to increase their cash levels.

The positive effect of growth opportunities on cash levels is in contrast to the prediction of the agency theory, however, according to the agency theory, managers of those firms that have more investment and growth opportunities might use cash for their own interest (Opler et al. (1999). Thus, entrenched managers are expected to accumulate cash balances, but they are likely to use them for their own endeavours. In this context, firms' growth opportunities are expected to be negatively related with cash levels. When we compare our find of positive impact of growth opportunities on cash with the findings of previous studies, we observe that this finding strongly supports the literature. For example, Opler et al. (1999), Ozkan and Ozkan (2004), Ferreira and Vilela (2004), Guney et al. (2007), and García-Teruel and Martínez-Solano (2008), have documented the same findings. Further Duchin (2010), Uyar and Kuzey (2014), Duchin (2010), Bates et al. (2009), Almeida et al. (2004), Ogundipe et al. (2012), Kim et al. (2011), and Rizwan and Javed (2011), have also reached at the same conclusion.

However, the findings of some studies such as Dittmar and Mahrt-Smith (2007), Bigelli and Sánchez-Vidal (2012), and Han and Qiu (2007) provide evidence indicating that firms that have more growth possibilities have less cash reserves. The positive impact of growth opportunities (Tobin's Q) on firms' cash holdings that we present here holds for both financially constrained and unconstrained firms. These impacts are also statistically significant. However, one should note that the extent of the impact of Tobin's Q on cash

levels is different across both kinds of firms. In particular, we find that the estimated coefficient on Tobin's Q for financially constrained firms is 0.031, whereas, the corresponding figure for financially unconstrained firms is only 0.005. The magnitudes of these estimates suggest that there are significant asymmetries in the response of cash holdings to growth opportunities across constrained and unconstrained firms. These estimates imply that when Tobin's Q increases by one unit, the cash level of financially constrained firms will increase by 0.031 units (3 percent of total assets), whereas, the cash balance of financially unconstrained firms will enlarge by only 0.005 units (0.5% of total assets).

The large impact of Tobin's Q on cash levels of constrained firms than their unconstrained counterparts is consistent with the findings of Almeida et al. (2004). They have reached at the same conclusion that the cash holdings of decisions of firms that have limited approach to external capital markets are more profoundly related to their growth opportunities.

Analogously, Han and Qiu (2007) have also found the similar results when they used firm size and bond ratings as financial constraints criteria. The higher Q-sensitivity for financially constrained firms than that of financially unconstrained firms is consistent with our prior that firms facing financial constraints are more likely to increase their cash balance with growth opportunities.

Constrained firms build excess cash reserves to capitalize their future investment opportunities as these firms have restricted access to external capital markets. Said differently, financially constrained firms hold more cash in order to undertake projects

having positive net present value (Keynes (1936)). It is also hypothesized that firm that have easily excess to external capital markets need not to mount up their cash balances as buffer their against future capital needs. In sum, the asymmetric sensitivity of cash holdings to Tobin's Q across financially constrained and unconstrained firms that we report here is not only in line with the previous empirical evidence but it is also consistent with our prior.

Our findings that both types of firms determine their cash levels asymmetrically are hold for different financial constraints criteria we use in this study. These classification schemes are payout ratio and Whited and Wu index. As we can see from the table that there are considerable differences in sensitivity of cash holdings to its determinants between constrained and unconstrained firms are statistically significant. In case of both the payout ratio and WW index measures the differences cash sensitivity are in line with our prediction.

Although, the sign and statistical significance of the estimates for the payout and WW index measures are similar to those for the firm size measure, the size of the estimated coefficients is different. For example, the estimated coefficients on lagged cash holdings are 0.366 and 0.474, respectively, for constrained and unconstrained firms sorted out based on the payout ratio measure. However, the corresponding estimates are 0.396 and 0.460 for the WW index measure. This implies that firms that the constrained and unconstrained firms sorted out based on the payout ratio measure are likely to adjust their cash levels more quickly as compared to the each types of firms classified based on the firm size and WW index measure.

Similarly, the estimated coefficients on the cash flows and cash flow volatility are also different in size across all three-classification schemes. Apart from the differences in magnitude we find consistence evidence that the cash flow sensitivity of cash is higher for financially constrained firms than their unconstrained counterparts. Further, the volatility of cash flows volatility is positively related to cash holdings for firms with limited entrance to capital markets while it is negatively related to cash holdings of firms that do not have any limitation on external financing. This finding is robust for all three measures used to stratify firms into financially constrained and unconstrained clusters.

The negative influence on cash of size for firms those without ease access to external capital markets. However, the magnitude of the coefficient on firm size for these firms is smaller for the payout ratio and WW index measure than that of for the firm size measure. However, the positive response of cash holdings of firms those do not have easy access to external debt markets is larger for the payout ratio measure as compared to other two measures. The negative leverage sensitivity of cash holdings of both types of firms is robust across all three measures. However, the estimated coefficients of leverage for financially constrained firms are larger for the WW index measure. The positive effect of firm size on cash stocks of firms confirms the findings of Almeida et al. (2004) that also suggest that large financially unconstrained firms are likely to build more excess cash balances. The corresponding figure for financially unconstrained firms' cash balances in balance larger for the payout ratio measure. Regarding the asymmetric effect of firms' dividend policy on cash is similar for all three measures.[13]

[13] One should note that we did not get the value of the coefficients on the interaction value of dividend payments and financially constraint dummy. This is because we classify the firm as financially constrained

With regard to investment and growth opportunities of firms, we show that the greater sensitivity of Tobin's Q for firms those have limited facility for external financing hold for all three measures. However, the size of coefficient on Tobin's Q for financially constrained firms is smaller for the WW index as compared to the firm size and payout ratio measures. The estimated coefficients of Tobin's Q for financially unconstrained firm are larger in size for the payout ratio measures as compared to the other two tools.

Overall, the results presented in Table 10 suggest that there are significant asymmetries in response of cash holdings to its determinants across both constrained and unconstrained corporations. The results also suggest that these asymmetries are robust to different classification measures we use in this study (firm size, payout ratios, and WW index). Finally, the results suggest that the differences in sensitivity of cash holdings across both types of firms are significance not only in terms of sign but also in terms of magnitude. That is, the extent at which firms cash balances are affected by firm characteristics considerably differs between financially constrained and unconstrained firms. These findings are consistent with our prior and strongly support the findings of previous empirical studies that have been documented that financially constrained and unconstrained determine their cash holdings differently.

4.4.3 Growth Potentials and Effects of Cash Determinants

In previous section, we present significant evidence of the differential impacts of determinants of cash for financially constrained and unconstrained firms. There are also

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is if they do not pay dividend. Therefore, it is not possible to get estimates on the interaction between dividend payout ratio and financial constraint dummy.

views in the literature that high-growth and low-growth firms are likely to determine their cash balance differently. Indeed some studies, such as Sauddour (2006) Azmat (2009) have examined the asymmetries in cash holding across high-growth and low-growth firms. However, these studies are very limited in number and their results are also inclusive. Therefore, we have not enough evidence how high-growth and low-growth firms response differently while accumulating decreasing their cash reserve. It would be worthwhile to further investigate the cash holding decisions of firms along these lines to enhance our understanding of why and when firms stockpile of cash.

In this subsection, we present another set of result by estimating equation (3). One should note that the model we estimated here is different from the one estimated in the literature. In particular, the previous studies have estimated the model for separate subsamples of high-growth and low-growth firms. However, in contrast, we formulize our model in such a way that it yields differential estimates for each variable included in the regression. We categorize high-growth and low-growth firms based on Tobin's Q. Our choice of this measure of classification is consistent with Saddour (2006), Ozkan and Ozkan (2004), and Azmat (2009).

Table 11 presents results. The table reveals significant evidence of the differential impact of determinants of cash holdings across high-growth and low-growth firms. These differences exist both in terms of sign and size of the estimates. Before interpreting the estimates on cash determinants we have a helicopter look on the diagnostic tests, which are given in Panel B of Table 11. Specifically, Panel B exhibits firm-year observations, number of firms, J-statistics, and the Arellano and Bond (1991), AR(2), test along with their p-values.

Table 11: Differential Impact of Cash Holdings Determinants across High-growth and Low-growth Firms

This table presents the results for the empirical determinants of cash holdings for high-growth *versus* low-growth firms. We use the robust two-step system-GMM estimator to estimate the model. Specifically, we estimate the following model for quantifying the differential effects of the empirical determinants of corporate cash holdings.

$$CH_{i,t} = \left(\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}\right) \times D_{i,t}^{hgrowth} + \left(\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}\right) \times D_{i,t}^{lgrowth} + Y_t + V_i + \beta_0 + \delta D_{i,t}^{hgrowth} + \varepsilon_{i,t}$$

where CH denotes the cash holdings of firm i for time t, which are defined as cash plus short-term investments divided by the book value of total assets. The one-period lagged value of cash holdings is also included in the regression as an independent variable in order to control for the dynamic of cash holdings. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows (CFV) is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. Year dummies (Y) are also included to control for year-specific fixed effects. V denotes individual firm-specific fixed effects, $\varepsilon$is the error term. $D_{i,t}^{hgrowth}$is a dummy for high-growth firms. It takes value one in year t if the firm is categorized as high-growth firm in the corresponding year and otherwise zero. $D_{i,t}^{lgrowth}$is a dummy for low-growth firms. It takes value one for year t if the firm is categorized as low-growth firm in the corresponding year and otherwise zero. We separate the firms into high-growth firms (HGF) and low-growth firms (LGF) based on Tobin's Q. Information regarding firm-year observations, total number of firms, diagnostic tests, and their p-values are given in Panel B of the table. The J-statistic is the Hansen (1982) test for testing the orthogonality condition for the instruments used in the estimation. The AR(2) is the Arellano-Bond (1991) test for testing the presence of second order autocorrelation in the residuals. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm. *** and ** denote the significance at the 1% and 5% level of significance, respectively.

Panel A: Estimation Results		
Variables	**Coefficient**	**Std. Error**
$D_{i,t}^{hgrowth} \times CH_{i,t-1}$	0.280***	0.007
$D_{i,t}^{lgrowth} \times CH_{i,t-1}$	0.520***	0.013
$D_{i,t}^{hgrowth} \times CF_{i,t-1}$	-0.061***	0.012
$D_{i,t}^{lgrowth} \times CF_{i,t-1}$	0.031***	0.004
$D_{i,t}^{hgrowth} \times CFV_{i,t-1}$	0.128***	0.008
$D_{i,t}^{lgrowth} \times CFV_{i,t-1}$	0.028**	0.013
$D_{i,t}^{hgrowth} \times SIZ_{i,t-1}$	0.006***	0.000
$D_{i,t}^{lgrowth} \times SIZ_{i,t-1}$	-0.001***	0.000
$D_{i,t}^{hgrowth} \times LEV_{i,t-1}$	-0.176***	0.007
$D_{i,t}^{lgrowth} \times LEV_{i,t-1}$	0.041***	0.007
$D_{i,t}^{hgrowth} \times DIV_{i,t-1}$	0.411***	0.081
$D_{i,t}^{lgrowth} \times DIV_{i,t-1}$	0.572***	0.047
$D_{i,t}^{hgrowth} \times TQ_{i,t-1}$	0.027***	0.002
$D_{i,t}^{lgrowth} \times TQ_{i,t-1}$	-0.022***	0.008
$D_{i,t}^{hgrowth}$	0.061***	0.008
Constant	0.004**	0.002
Panel B: Diagnostic Tests		
Firm-years	3559	
Firm	451	
AR(2)	-0.78	
p-value	0.438	
J-statistic	228.37	
p-value	0.645	

We do not find any significant evidence of the existence of second order serial correlation in the residuals. The J-test also suggests that the null hypothesis of instrument validity not rejected. That is, the instruments are orthogonal to the residuals. Both of these tests confirm that our instruments are valid.

The estimated coefficients of the high-growth dummy is positive (0.061) and appears significant at better than the 1% level of significant. This implies that high-growth firms are preferred to hold more cash, on average, than low-growth firms. This finding is consistent with our expectation as we expect earlier that growing firms hold more cash to finance their potential future investments. This observation is also consistent with the summary statistics presented in Table 11 of this study. Turning to firm-specific determinants of firms' cash levels we find that the estimate of lagged cash holdings is 0.280 for high-growth firms while the corresponding figure is 0.520 for low-growth firms. This finding indicates that low-growth firms adjust their cash balances towards the target level at higher speed as compared to high-growth firms.

We find that the cash flow sensitivity of cash is negative and significant for high-growth firms while it is positive and significant for low-growth firms. This indicates that with an increase in one unit of cash flows, high-growth firms decrease their cash stocks by 6.1% of their assets, whereas, low-growth firms increase their cash balances by 3.1% of their assets. The results also confirm that the impact of cash flow volatility on cash holdings is positive and significant for both low-growth and high-growth firms. However, the estimated coefficient on cash flow volatility is larger for high-growth firms than low-growth firms (0.128 and 0.028, respectively).

Our results also suggest that high-growth firms increase their cash balances with size. Yet, low-growth firms are expected to decrease the cash with size. The coefficient estimates on leverage also suggests that leverage has differential impacts on cash holdings of high-growth *versus* low-growth firms. In particular, we find that influence on cash holdings of leverage is negative (with magnitude of 0.176) for high-growth firms while it is positive (with the magnitude of 0.041) for firms those have less growth opportunities. The results reveal that both low-growth and high-growth firms increase their cash balances when they pay dividends to their equity-holders. We find that the cash flow sensitivity of cash is negative and significant for high-growth firms while it is positive and significant for low-growth firms. This indicates that with an increase in one unit of cash flows, high-growth firms decrease their cash stocks by 6.1% of assets, whereas, low-growth firms increase their cash balances by 3.1% of their assets. The results also confirm that the impact of the cash flow volatility on cash holdings is positive and significant for both low-growth and high-growth firms.

However, the estimated coefficients on the cash flow volatility are larger for high-growth firms than low-growth firms (0.128 and 0.028, respectively). As can be seen from the table, high-growth firms increase their cash with size. Yet, low-growth firms are expected to decrease the cash with size. The coefficient estimates on leverage also suggest that leverage has differential impacts on cash holdings of high-growth *versus* low-growth firms. In particular, we find that the sensitivity of cash holdings to leverage is negative (with the magnitude of -0.176) for high-growth firms while it is positive (with the magnitude of 0.041) for low-growth firms. The results reveal that both low-growth and high-growth firms increase their cash balances when they pay dividend payments.

However, low-growth firms do so more as compare to high-growth firms. Interestingly, Tobin's Q is positively related to high-growth firms, while it is negatively related with cash holdings of low-growth firms. Both estimates are strongly significantly different from zero. This indicates firms that are categorized as high-growth firms increase their cash balances with their market to book value measured by Tobin's Q, while low-growth firms do the reverse when their market to book value increases.

Our results that the cash holdings of high-growth and low-growth firms are affected by firm-specific determinants of cash are consistent with our prior. These results suggest that both the trade-off and the transaction cost motives are significant in explaining the cash holding decisions of high-growth and low-growth firms. The results also indicate that the cash holding decisions of high-growth firms are in accordance with the pecking order theory as their cash balances are positively related to their size and the market to book value. However, the cash holdings behavior of low-growth firms is in contrast to the prediction of the pecking order theory. This is because cash levels of low-growth firms are negatively related to the size and the market to book value.

Our results of high-growth and low-growth firms are consistent with some previous empirical studies. For example, similar to us, Saddour (2006) and Opler et al. (1999) have also reported a negative impact of leverage on cash holdings of high-growth firms. Similarly, consistent with our findings, Saddour (2006) has shown that the cash holding decisions of high-growth firms are positively related to dividend payments and Tobin's Q.

Our finding that low-growth firms decrease their cash balances with their size is consistent with Opler et al. (1999) and Guney et al. (2003). Finally, the evidence of the positive effect of both lagged cash and cash flows on cash levels for both high-growth and low-growth firms support the findings of Saddour (2006). He has also reported the same effects of lagged cash and cash flows.

4.4.4 Investment Level and Effects of Cash Determinants

In this subsection we present our final set of results where we examine how the level of firm investment affects the cash holding behavior of firms. The empirical framework that we employ here is similar to our earlier approach. Further, for the purpose of consistency we utilize a same set of cash flow determinants. Specifically, we estimate equation (4) in order to see the asymmetries in cash flow determination across low and high-investments firms.

Table 12 presents the results. Inspecting the results given in the table we find there are some noticeable differences in the effects of cash flow determinants on cash across both high-investment and low-investment firms. For instance, the lagged value of cash holdings is more strongly related with current level of cash (0.510) for high-investment firms than low-investment firms (0.332).

We find that the corresponding figure is 0.332 for low-investment firms. This means that the speed of adjustment of cash holdings of high-investment firms is greater than the speed at which low-investment firms adjust their cash balances towards the target whenever they deviate from it.

Table 12: Differential Impact of Cash Holdings Determinants across High-investment and Low-investment Firms

This table presents the results for the empirical determinants of cash holdings for high-investment *versus* low-investment firms. We use the robust two-step system-GMM estimator to estimate the model. Specifically, we estimate the following model for quantifying the differential effects of the empirical determinants of corporate cash holdings.

$$CH_{i,t} = \left(\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}\right) \times D_{i,t}^{hinv} + \left(\beta_1 CH_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 CFV_{i,t-1} + \beta_4 SIZ_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DIV_{i,t-1} + \beta_7 TQ_{i,t-1}\right) \times D_{i,t}^{linv} + Y_t + V_i + \beta_0 + \delta D_{i,t}^{hinv} + \varepsilon_{i,t}$$

where CH denotes the cash holdings of firm *i* for time *t*, which are defined as cash plus short-term investments divided by the book value of total assets. The one-period lagged value of cash holdings is also included in the regression as independent variable in order to control for the dynamic of cash holdings. CF represents the cash flows of firms and is defined as income before tax plus depreciation divided by the book value of total assets. The volatility of cash flows (CFV) is defined as the standard deviation of the cash flow for each firm over the sample period. LEV denotes leverage, which is defined as total debt divided by total book assets. SIZ is firm size, which is defined as natural logarithm of book assets. DIV represents dividend payments and is defined as (total dividend + purchase of common and preferred stock)/book assets. Tobin's Q (TQ) is the ratio of the market value of assets to book value of assets. Year dummies (Y) are also included to control for year-specific fixed effects. V denotes individual firm-specific fixed effects. ε is the error term. $D_{i,t}^{hinv}$ is a dummy for high-investment firms. It takes value one in year *t* if the firm is categorized as high-investment firm in the corresponding year and otherwise zero. $D_{i,t}^{linv}$ is a dummy for low-growth firms. It takes value one for year *t* if the firm is categorized as low-investment firm in the corresponding year and otherwise zero. We use net investment expenditure to split firms into high-investment firms (HIF) and low-investment firms (LIF). Information regarding firm-year observations, total number of firms, diagnostic tests, and their p-values are given in Panel B of the table. The J-statistic is the Hansen (1982) test for testing the orthogonality condition for the instruments used in the estimation. The AR(2) is the Arellano-Bond (1991) test for testing the presence of second order autocorrelation in the residuals. The study use an unbalanced annual panel data set covering the period from 2000 to 2012. The sample consists of non-financial firms listed at Karachi Stock Exchange. The data are collected from Balance Sheet Analysis of Non-Financial Firm. *** denote the significance at the 1% level of significance, respectively.

Panel A: Estimation Results		
Variables	**Coefficient**	**Std. Error**
$D_{i,t}^{hinv} \times CH_{i,t-1}$	0.510***	0.004
$D_{i,t}^{linv} \times CH_{i,t-1}$	0.332***	0.003
$D_{i,t}^{hinv} \times CF_{i,t-1}$	0.073***	0.002
$D_{i,t}^{linv} \times CF_{i,t-1}$	-0.026***	0.001
$D_{i,t}^{hinv} \times CFV_{i,t-1}$	-0.019***	0.004
$D_{i,t}^{linv} \times CFV_{i,t-1}$	0.176***	0.003
$D_{i,t}^{hinv} \times SIZ_{i,t-1}$	0.007***	0.000
$D_{i,t}^{linv} \times SIZ_{i,t-1}$	0.006***	0.000
$D_{i,t}^{hinv} \times LEV_{i,t-1}$	-0.057***	0.001
$D_{i,t}^{linv} \times LEV_{i,t-1}$	-0.166***	0.002
$D_{i,t}^{hinv} \times DIV_{i,t-1}$	0.260***	0.010
$D_{i,t}^{linv} \times DIV_{i,t-1}$	0.128***	0.010
$D_{i,t}^{hinv} \times TQ_{i,t-1}$	0.005***	0.000
$D_{i,t}^{linv} \times TQ_{i,t-1}$	0.007***	0.000
$D_{i,t}^{hinv}$	-0.074***	0.002
Constant	0.067***	0.002
Panel B: Diagnostic Tests		
Firm-years	2765	
Firm	433	
AR(2)	-1.40	
p-value	0.161	
J-statistic	377.96	
p-value	0.947	

Our results exhibit that the flow of funds has a positive impact on cash holdings for high-investment firms while it is negatively related with low-investment firms' cash holdings. That is, high-investment firms increase their cash reserves when they have more cash flows. However, the low-investment firms deplete their cash stocks when they have higher levels of cash flows. Regarding the impact of the cash flow volatility we observe that the impact on cash holdings of high-investment firms is significantly negative while the effect for firms those do low investment is positive.

The cash holdings of both types of firms are positively related to their size. This implies that big firms mount up cash amounts regardless of whether they do more or less investment expenditures. The positive size impact is consistent with both the pecking order theory and the agency cost theory. These theories predict the positive relationship between size and cash holdings. Consistent with previous empirical literature and finance theories, namely the pecking order and the agency theory, leverage is negatively related to cash holdings of both categories of firms. However, this negative relationship is significantly stronger for low-investment firms as compared to high-investment firms. We also find that the dividend policy of firms positively related with their cash holdings. This observation holds for both low-investment and high-investment firms. However, the cash holdings of high-investment firms are more strongly related to their dividend payments than that of low-investment firms.

The influence of Tobin's Q on cash holdings on both types of firms supports the explanation of the trade-off theory as well as with the pecking order theory. In particular, the estimated coefficients on Tobin's Q are positive, suggesting firms having high market to book value aggressively accumulate their cash balances. Firms do so regardless of their

investment policy is active or passive. Finally, we observe that high-investment firms, on average hold less cash than their low-investment counterparts.

In sum, the results regarding the role of investment reveal that the determinants of cash holding decisions of firms across low-investment and high-investment firms. These differences exist in terms of both sign and magnitude of the estimates. This set of result is one of the important contributions of our study into the literature of cash holdings. These results suggest that the level of firms' investment expenditure is important for exploring firms' cash holding decisions. These results also suggest that researcher should consider firm investment expenditures over and above the growth level and financial constraints in explaining asymmetries in cash holding decisions of firms.

Chapter 5

Conclusion

5.1 Dissertation Snapshot

There is growing literature on why firms hold excess cash balances. The prior empirical studies have largely focused on exploring the firm-specific determinants of cash holding decisions of firms. Yet, these studies have mainly studied the determinants of cash for developed countries such as, the United States, the UK, Japan, Canada, Germany, and France. In general, these studies have successfully related the cash holdings of firms with their cash flows, size, leverage, and the market to book value. However, only few studies have provided significant evidence on the role of financial constraints on firms' cash holding policies. Nevertheless, the previous studies estimating separately regression for both types of firms have shown that the cash holdings respond differently to its determinants across financially constrained and unconstrained firms.

The empirical evidence on this issue regarding developing countries however is very scanty. Yet, examining this issue for developing countries would enhance our overall understanding as financial market in developing countries suffer more from frictions. To bridge this gap, in this study, we examined the effect of financing constraints on firms' cash holding decisions. We used three different measures, (firm size, payout ratio, and Whited and Wu index) to categorize firm into financially constrained and unconstrained classes. We proposed the empirical framework, which

yields different estimates of each variable included in the model for financially constrained and unconstrained firms.

None of the existing empirical studies has examined the differential impact in this spirit. Using similar econometrics framework, we also examine the differential impacts of cash determinants on cash holdings of firms across high-growth and low-growth firms. Finally, we examine the impact of level of firms' investment on the cash holding behavior of firms.

We use an unbalanced annual panel data set obtained from Balance Sheet Analysis of Non-Financial Firms published by the SBP. The data regarding stock prices is collected from KSE data portal. Our sample includes 451 firms with 3559 firm-year observations. The study covers the period from 2000-2012. We use cash flows, the cash flow volatility, firm size, leverage, dividend payout ratio and the market to book value (Tobin's Q) as firm-pacific variables in our empirical models.

To estimate the models, we use the robust two-step system GMM estimator proposed by Arellano and Bover (1995) fully developed by Blundell and Bond (1998). We prefer this estimate to others as it helps to mitigate the problem of endogeneity and hetroskedasticity. Further, this estimator utilizes all moment conditions. Finally, this estimator estimating the model simultaneously in levels and first-differenced forms keep variability across firms.

5.2 Summary of Findings

The validity of the estimates critically lies upon the robustness of the instruments. We use the Arellano-Bond AR (2) test of autocorrelation and the J-test of Hansen (1982) to ensure the orthogonality of the instruments. The results of these diagnostic tests provide strong evidence of the statistical independence of the instruments. We observe that firms those have limited access to external financing, on average, hold more cash reserves as compared to those are comfort in obtaining external funds. We also observe that the cash balances of financially constrained firms are more volatile than that of their financially unconstrained counterparts. Our observations are consistent with Almeida et al. (2004) and Han and Qiu (2007), who also show that the mean value of cash is greater for financially constrained firms than financially unconstrained firms. Summary statistics also shows that both high-growth and high-investment firms on average accumulate more cash balances than their corresponding low-growth and low-investment counterparts. However, the cash holdings of high-growth (low-investment) firms are relatively more variable.

Correlation estimates provide evidence of differential association between cash holdings and its determinants across financially constrained and unconstrained firms. For example, we find that cash flows and leverage are more strongly correlated with cash holdings for unconstrained firms. Similarly, size is negatively correlated with cash for constrained firms, whereas, it is positively correlated to cash for unconstrained firms. The correlation estimates also show that the market to book value of firms is more strongly related to the cash holdings of constrained firms than unconstrained firms.

The results from the baseline model are consistent with earlier studies that work firm-specific cash-holding determinants. Specifically, we show that one-period lagged cash holdings have a positive and significant effect on the current cash levels. This finding implies that firms considerably adjust their cash balances through their target when they deviate from them due to a shock. We also show that both cash flows and the volatility of cash flow have significant and positive effects on cash. These findings strongly support the findings of several previous empirical studies including Al-Najjarand Belghitar (2011), Guney et al. (2007), Saddour (2006), Gao et al. (2013), and Han and Qiu (2007). The results from the baseline model also reveal that larger and high-levered firms are likely to hold less cash reserves. Larger firms do so as they face less hurdles in obtaining funds from external capital markets that can easily raise capital to finance their potential future investment.

Numerous prior studies like Bates et al. (2009), Almeida et al. (2004), Gao et al. (2013), Han and Qiu (2007), Ozkan and Ozkan (2004), Ferreira and Vilela (2004), and Opler et al. (1999) have also shown negative impacts of firm size and leverage on firms' cash holdings. Finally, we find that the accumulation of cash is significantly and positively related to payout ratio and the market to book value of firms. These findings firms confirm the results of Opler et al. (1999), Ozkan and Ozkan (2004), Chen (2008), Al-Najjar and Belghitar (2011), Ferreira and Vilela (2004), Guney et al. (2007), Uyar and Kuzey (2014), and Duchin (2010) who also reported the positive effects of both of these variables on cash. The baseline regression results suggest that the trade-off theory as well as the pecking order theory is significant for explaining the cash holding behavior of

listed firms in Pakistan. Further, the results of baseline model indicate that the transaction motives and the agency cost are also significant in determination of cash holdings.

When we turn to examine the differential effect of determinants of cash we observe significant differences in response of cash to its determinants between financially constrained and unconstrained firms. The following are some worth noting differences. Unconstrained firms align their actual cash balances with the target quickly than the constrained firms do. Cash holdings of financially constrained firms are more strongly related to their cash flows. Another striking finding is that the cash flow volatility has a positive impact on cash for financially constrained firms, whereas, it has a negative influence on cash for financially unconstrained firms. This implies that in periods when cash flows of firms are uncertain, constrained (unconstrained firms) increase (decrease) their cash stocks.

Another notable finding of our analysis is that large financially constrained firms hold less cash, while large financially unconstrained firms keep more cash in their hands. However, it should also be noticed that the negative effect of size on cash balances for financially constrained firms is significantly larger in absolute term than its positive impact on cash holdings of financially unconstrained firms. Dividend policy of firms is also asymmetrically related to cash across both types of firms. In particular, we show that constrained firms hold less cash when they pay dividends, whereas, unconstrained firms' increase their cash balances with dividend payments. Finally, we find that the market to book value (Tobin's Q) is positively related to cash holdings of both groups of firms, yet this relationship is considerably stronger in case of financially constrained firms. The coefficient of the financial constraint dummy shows that on average, financially

constrained firms hold more cash than financially unconstrained firms hold. These asymmetric effects of cash determinants on cash holding decision of firms and are robust to all three measures used to stratify firms into financially constrained and unconstrained categories. The differential sensitivity of cash is its determinants across both clusters of firms confirm the findings of the previous studies that provide evidence of the presence of asymmetric in cash holdings of financially constrained and unconstrained firms (e.g., Almeida et al. (2004), Han and Qiu (2007), and Duchin (2010)).

Our finding regarding high-growth and low-growth firms indicates that the response of cash to its determinants is different for both groups of firms. We separate the firms into high-growth and low-growth groups based on Tobin's Q used as a proxy for the market to book value. We observe that firms having more investment and growth opportunities keep more cash on average. The results reveal that firms with low-growth opportunities remove deviation from the target level of cash more quickly than the high-growth firms do. We also show that high-growth (low-growth) firms decrease (increase) their cash balances in response to increase in their cash flows and leverage.

On the other side, firm size and the market to book value both exert a positive (negative) influence on the cash structure of high-growth (low-growth) firms. These asymmetric effects are in lines with our predictions and support the finding of the previous studies (e.g. Saddour (2006), Azmat (2009)). Our analysis also suggests that although the cash holdings of both high-growth and low-growth firms are affected positively by the cash flow volatility, this effect is more profound the former group than the later one. Quite appositively, the dividend policy of low-growth firms is more

strongly and positively related to their cash holding decisions as compared to high-growth firms.

The key findings emerging from the analysis for high-investment *versus* low-investment firms are as follows. First, the firms that do more investment expenditures, on average, hold less cash reserves. Such firms are also likely to adjust their cash balances towards the target level more rapidly whenever they deviate from the target. Second, cash flows exert a positive, while the cash flow volatility exerts a negative effect on cash balances of high-investment firms. On the other hand, both these variables have an opposite impact on cash reserves of low-investment firms. Third, we find that firm size, leverage, and the market to book value all of these three factors do not have any differential impact, in terms of sign, on the cash structure of both high-investment and low-investment firms. However, the extent of sensitivity of cash to these variables differs between high-investment and low-investment firms.

5.3 Policy Implications

The findings that we present in this dissertation are immensely as well as equally useful for managers, investors, academics/researchers and policy makers. Specifically, our findings indicate the firm-specific characteristics that are significantly related with firms' cash holding decisions. No doubt, understanding of the determinants of firms' cash holdings helps investors in deciding optimum investment choices. Our findings also provide help firm managers for designing effective cash holding policies. Specifically, our findings suggest that how financially constrained and unconstrained firms respond differently to firm-specific determinants of cash holdings. Our findings also increase our

understanding of cash holdings dynamics across different firms. Specifically, the findings indicate how future growth potential and firms' investment expenditures influence firms' cash holding behavior. Our findings also open new avenue for research on cash holdings of firms particularly in developing countries where financial markets are expected to suffer more market imperfections.

Last but not least, our findings are also significant for policy makers as we show that financially constrained firms on average are more likely to hold cash in their hand. Firms do so to provide safeguard against any future insolvency as financially constrained firms are not certain to raise funds from external capital market. Thus, they prefer to hold cash in their hand rather than investing it for productive activities. Reducing barriers to inter financial markets, establishing linkages between intermediaries and corporate firms, and taking steps to improve the overall functioning of capital market would definitely help to reduce the intensity of financial constraints. Thus, firms may easily obtain funds from external capital markets whenever they required and thus, they use their cash reserves for investment purpose rather than keeping in hand.

5.4 Future Area of Research

Our work can be extended in several dimensions. Some of these dimensions are as follows. First, we provide evidence on firm cash holding using firm level panel data. However, it would be worthwhile to explore whether firms belong to different industries design their policies differently. It would also be useful to examine the cash holding behavior across business cycle. Specifically, someone may explore how macroeconomic conditions affect firms' cash holdings status. Finally, in this thesis, we examine the role

of cash holdings decisions of firms and financial constraints. Yet, it would also be worthwhile to explore how financial constraints affect firms' cash holding decisions through their effects on affecting other firm characteristics such as credit lines, R&D (research and development) expenditures, acquisitions, cash conversion cycle.

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