



Firm value and optimal cash level: evidence from Pakistan

Qurat-ul-ann Azmat

National University of Sciences and Technology (NUST),
NUST Business School, Islamabad, Pakistan

Abstract

Purpose – The purpose of this paper is to investigate the relationship between firm value and cash holdings for the period 2003-2008. This study seeks to find if there are costs and benefits associated with holding too much or too little cash, then an optimal cash level exists where marginal benefits are offset by their costs. If this optimal point exists, then firm value will be maximized at that point and deviation from it will affect the firm value negatively.

Design/methodology/approach – Optimal cash level between firm value and cash holding is determined by investigating the concave relationship. If concave relationship exists then a residual term is included in the equation to see how deviations from the optimal level affect firm value. A two-step generalized method of moments (GMM) estimator is used in estimating all results. GMM controls for unobserved firm heterogeneity and endogeneity problems.

Findings – Results showed that a concave relationship exists between firm value and cash holdings, which confirmed that there is an optimal cash level that maximizes firm value. It was also found that deviations from the optimal level affect firm value negatively.

Practical implications – The paper provides the existence of an optimal point of cash between costs and benefits wherein firm value is maximized. It has implications for firms' investment and financing decisions when there is limited access to external finance. At higher level of cash the study has implications for agency theory and governance practices.

Originality/value – The study establishes a conclusive relationship between firm value and cash holdings within the context of the Pakistani market.

Keywords Firm value, Panel data, GMM, Cash holdings, Optimal cash level

Paper type Research paper

Introduction

Corporate cash holding is a phenomenon which is very important in corporate finance but has long been ignored by finance researchers. According to Mayer (1990) almost 75 percent of all net financing is done through cash reserves rather than debt, convertibles and equity. Thus, relevant questions arise, such as why do firms hold cash balances? What is the optimal level of cash? And how does it affect firm value? These questions are very important and need to be answered to understand firms' policies on cash. This area received the attention of researchers when some large firms like Microsoft Corporation and Exxon Mobil had more than \$30 billion in cash at the end of 2006. Apple and Google Inc. held more than \$10 billion (Frésard, 2009). This situation raised serious questions as to why these firms were holding so much of their assets in the form of cash and marketable securities even when these assets give only nominal return and are not valued by investors (Faulkender and Wang, 2006).

The first study to investigate the determinants leading to accumulation of cash holdings by US firms was done by Kim *et al.* (1998). They reported that firms facing higher costs of external financing and having more volatile earnings and those with relatively lower returns on assets hold significantly larger liquid assets. Furthermore, Opler *et al.* (1999) provided evidence that small firms and those with strong growth opportunities and riskier cash flows hold relatively high ratios of cash to total non-cash



assets. Also, firms that have greater access to the capital markets, such as large firms and those with high credit ratings, tend to hold lower ratios of cash to total non-cash assets. Later, Pinkowitz and Williamson (2001) performed an international study of firms in the USA, Germany and Japan adding to the findings of Opler *et al.* (1999). They found that the monopoly power of banks has a significant impact on cash balances. Ozkan and Ozkan (2004) highlighted[1] the determinants of cash holdings for a sample of the firms in the UK. The results showed that a firm's ownership structure plays an important role in determining cash holdings. Additionally, the research revealed that a firm's growth opportunities, cash flows, liquid assets, leverage and bank debts are important in determining its cash holdings. Later, Drobetz and Gruninger (2007) investigated the determinants of cash holdings in Switzerland with the argument that governance practices are somewhat different there than those in the USA/UK. The results of their investigation supported the agency explanation. These researches showed that this phenomenon is not restricted just to US or UK firms but is present in other countries as well. The resulting determinants vary from country to country depending upon their institutional settings. This situation further encourages the need for more research in this area especially in the context of a developing country like Pakistan.

As reported by Afza and Adnan (2007) the mean cash ratio for a sample of Pakistani firms is about 13.5 percent for the period 1998-2005. These statistics are reasonably close to US firms' mean cash ratio of 17 percent as reported by Opler *et al.* (1999) and the European firms' mean cash ratio of 14.8 percent as reported by Ferreira and Vilela (2004). Later, Shah (2010) reported the average cash ratio for a sample of 370 firms listed on the Karachi Stock Exchange (KSE) over the period 2000-2004 is 8.61 percent, which is close to the 8.1 percent mean cash ratio Kim *et al.* (1998) found for US firms and the 9.9 percent Ozkan and Ozkan (2004) found for UK firms. This evidence shows that cash ratios in Pakistan are quite high similar to those in developed countries. This issue serves as an important research question which needs to be answered; corporate insiders are supposed to take steps to maximize the wealth of the outside shareholders, but piling up a firm's asset into a least-productive one is a difficult strategy to justify.

The present study is based on the notion that in case of market imperfections firms need to hold cash. The literature on cash holdings showed that there are costs and benefits of holding cash. The benefits of holding cash include certain motives like precautionary motive, transactional motive and avoiding the high cost of external financing due to information asymmetry, etc.

The costs of holding higher cash reserves include agency conflicts between managers and shareholders and the opportunity cost of holding assets with minimal returns. Thus, it is expected that an optimal point exists where the cost of holding cash will be offset by its benefits and firm value is maximized (model developed by Opler *et al.*, 1999).

Earlier set of studies related to the determinants of corporate cash holdings (e.g. Opler *et al.*, 1999; Drobetz and Gruninger, 2007; Shah, 2010) describe that there is a target cash ratio, and that firms follow partial adjustment models for making their cash decisions. However, there is no empirical evidence in the context of Pakistan which suggest why firms follow a partial adjustment model and how it affects the firms' value. In this paper an attempt is made to fill this gap by asking: is there any optimal level of cash where a firm's value is maximized? If there is an optimal cash level then deviations from that level will affect firm value negatively.

The present study compliments the findings of Martinez-Sola *et al.* who reported that there is an optimal level of cash holding which maximizes firm value and deviation from that level decreases the firm value. Additionally, the findings are an extension of the results of Kim *et al.* (1998) and Opler *et al.* (1999) which states the existence of target cash ratios.

Following the methodology developed by Martinez-Sola *et al.* optimal cash level is investigated by finding the concave relationship between firm value and cash holdings. If that relationship holds it can be expected that deviations from optimal level will reduce firm value. Tong (2008) methodology is applied in which a model is described which include the residuals and interaction term.

For the present study a sample of 261 KSE listed Pakistani firms are selected for the period 2003-2008. The data are panel in nature and Arellano and Bond's (1991) two-step Generalized Method of Moments (GMM) estimator is applied.

The rest of the paper is organized as follows: second section includes a review of the literature; third section describes data and methodology; fourth section presents empirical results; and fifth section shows conclusion.

Literature review

In the frictionless world of Miller and Modigliani there are no optimal cash levels and firms can raise funds any time whenever they find that internal funds are insufficient for their daily operations and for financing positive net present value (NPV) projects. Under these circumstances, firms are not expected to hold cash as these holdings do not create any shareholder wealth. As opposed to the perfect capital market's predictions, literature shows that US firms, as well as European ones, hold significant amounts of cash on their balance sheets (e.g. Kim *et al.*, 1998; Opler *et al.*, 1999; Dittmar and Smith, 2003; Ferreira and Vilela, 2004). This is because in reality there are market imperfections which induce firms to hold cash.

The trade-off theory and pecking order theory explained different motives of firms for holding cash. Under the trade-off theory, the benefits of holding cash include its role as a safety buffer for avoiding situations in which a firm has to go to the financial markets for raising funds, or liquidating existing assets for financing its growth opportunities. Besides cash holdings reduce the likelihood of financial distress; and allow investment even when some financial constraints are binding. In the presence of adverse selection costs securities may be mispriced and firms prefer internal over information-sensitive external financing. If adverse selection costs become extreme, a firm may find it more profitable not to sell securities and even forego investments. In such situations holding cash balances is useful for the firm. In addition to the adverse selection cost there is an agency cost of debt. It arises when the interests of shareholders deviate from the interests of debt holders or among different classes of debt holders. Moral hazard problems make it difficult and expensive for highly leveraged firms to raise additional debt, or renegotiate existing debt contracts to prevent bankruptcy. Jensen and Meckling (1976) argue that these firms have strong incentives to engage in asset substitution, making debt more expensive in terms of the required yield and in terms of the covenants attached to the debt. Moreover, highly leveraged firms will likely suffer from under investment problem, where the old shareholders have little incentive to provide additional equity capital even when a firm has profitable investment projects because the cash flows from these investments disproportionately accrue to the creditors. In both cases agency costs of debt are so high that firms cannot raise funds and forego profitable investment projects. Therefore, it is valuable to build up cash balances.

Pecking order theory explains firm cash holdings in terms of asymmetric information (Myers and Majluf, 1984). It describes that when operational cash flows are high, firms use them to finance new profitable projects, to repay debts, to pay dividends and finally to accumulate cash. When retained earnings are insufficient to finance new investments, a firm first uses its cash holdings and then issues new debt; finally, when it is out of its debt servicing capacity, firm issues securities. This can generate underinvestment problems because there can be the possibility that a firm chooses not to issue securities and will pass a positive NPV project (Myers, 1977). This situation can be avoided if a firm retains enough internally-generated cash to cover its profitable investment opportunities (Myers and Majluf, 1984).

Besides benefits there are costs associated with holding cash, such as low pecuniary returns and tax disadvantages from the shareholders' point of view, i.e. if a firm holds liquid assets, the accrued income is taxed twice and shareholders can earn a higher pre-tax return from holding these securities directly. Moreover, there are the costs of managerial discretion because now managers have larger assets under their control (Jensen and Meckling, 1976). Managers hold excess cash because they are risk averse (Fama and Jensen, 1983). Managers are not fully diversified because they cannot divide their human capital; therefore more entrenched managers hold excess cash to avoid market discipline. It is also argued that in the presence of managerial discretion, managers have incentives to hold large amounts of cash so that they can have more flexibility to pursue their own objectives (Jensen, 1986; Drobetz and Gruninger, 2007). Cash allows them to make investments that capital markets will not be willing to finance, and avoid the discipline of capital markets. Consequently, there are two conflicting explanations of cash holdings which lead to the existence of optimal levels of cash.

There have been many studies which have examined the relationship between cash holdings and firm value. Most of them have answered this phenomenon in the context of governance; it is argued that cash holdings which are not needed for investments or operations can easily be spent by the management. Dittmar and Marth-Smith (2007) reported that governance has a significant impact on firm value through its impact on cash policy. The market value of the firms holding excess cash reserves are reduced by up to one-half when they are governed poorly. Moreover, they found that firms with poor governance invest their excess cash reserves in assets that have low accounting returns. Faulkender and Wang (2006) examined the cross sectional variations in the value of cash holdings due to the changes in the corporate financial policy. Results showed that marginal value of cash decline with larger cash holdings, higher leverage, better access to capital markets and when firms choose to distribute cash through dividends rather than repurchases. Pinkowitz and Williamson (2007) investigated the market value of cash held by the firms. They found that firms with good growth options had their cash valued at premium than those with poor growth prospects. Further, firms with stable investment programs and those who are near to financial distress are valued lower by the investors.

An international study of Pinkowitz *et al.* (2006) showed that countries with poor indices of right enforcement are generally in Asia and South America. Furthermore, their results explained that the relationship between cash holdings and firm value is much weaker in countries with poor investor protection as compared to those with stronger protection. Pakistan comes under the category of countries with strong shareholder rights but weak enforcement (La Porta *et al.*, 1998). Thus, it can be implied from the study of Pinkowitz *et al.* (2006) that Pakistani investors value a firm's liquid assets less due to the weaker protection of their rights. Huang and Zhang (2008)

performed an international study in which effects of corporate transparency on value and level of corporate cash holdings were investigated, their sample countries include Pakistan as well. They found that a firm's holding of liquid assets decreases with the level of corporate transparency, and cash resources are rewarded with higher market valuation when firm's transparency is improved. Paskelian and Nguyen (2010) reported that concentrated family ownership is prevalent in India, and investors assign higher value to cash holdings in firms with high family ownership as compared to those with low family ownership. This study has important implications for Pakistan because, like India, Pakistan is in the same economical region. Pakistani firms are also characterized as having concentrated ownership, family control, pyramidal structures, interlocking directorship and cross shareholdings (Cheema, 2003; Zaidi and Aslam, 2005; Javed and Iqbal, 2006). Thus, it can be inferred from the study of Paskelian and Nguyen (2010) that cash holdings of Pakistani firms with higher insider ownership are viewed positively by shareholders. Most of the previous studies have explained the relationship between firm value and cash holdings in terms of agency theory but direct relationship is still unexplored.

Therefore, two different effects of cash holding on firm value are determined. On one hand, at lower levels of cash transaction and precautionary motives will predominate so an increase in cash level will increase firm value. On the other hand, free cash flow and opportunity cost will be responsible for higher cash levels and will lead to a reduction in firm value. Therefore, a nonlinear relationship is expected between cash holdings and firm value which represents an optimal point where firm value is maximized.

On the basis of above arguments present study investigates the following hypothesis:

- H1. Existence of an optimal cash level between firm value and cash holdings.
- H2. Optimal cash level maximizes firm value.
- H3. Deviation on either side of optimal cash level decreases firm value.

Data and methodology

Data

Initially, all listed Pakistani firms on the KSE over the period 2003-2008 are included in the sample. However, financial firms are excluded because they hold liquid assets for different reasons than other firms (Pinkowitz *et al.*, 2003; Drobetz and Gruninger, 2007). The data are taken from "Balance Sheet Analysis of Joint Stock Companies Listed on Karachi Stock Exchange (2003-2008)," a publication of the State Bank of Pakistan. The publication provides information about balance sheets and income statements of all the listed non-financial[2] firms. In addition, a firm's market valuation data were also required which is taken from breccorder.com. The information about non-financial firms is refined, eliminating firms with errors or lost values for accounting variables use in the study. The study also removes firms that are presumably in financial distress as denoted by their negative equity figures. After applying the corresponding filters, a panel comprising 1,566 observations of 261 firms is obtained.

Variables

Tobin's Q. In most of the literature reviewed, Tobin's *Q* is used for measuring firm value (e.g. Yermack, 1996; La Porta *et al.*, 2002; Hoyt and Liebenberg, 2011) and for the

purpose of the present study Tobin's Q is taken as dependent variable. There are several formulas for measuring Tobin's Q . For the current study it is calculated as a ratio of market value of equity plus the book value of debt to the book value of equity (Javed and Iqbal, 2006; Saddour, 2006). For further confirmation of results another formula of firm value is used which is the ratio of market value to the book value of equity (total assets) (Dushnitsky and Lenox, 2006).

Cash. Cash is the main independent variable of the study. In the literature reviewed there are two common ways to calculate the cash ratio. The first and most common method is to divide cash and cash equivalents by the book value of total assets (e.g. Kim *et al.*, 1998). Other authors follow Opler *et al.* (1999) and normalize cash with net assets, i.e. book value of total assets minus cash and cash equivalents. Following Kim *et al.* (1998) cash ratio is calculated as the ratio of cash and cash equivalents to total assets for the present study.

Control variables. Following earlier literature (e.g. Dushnitsky and Lenox, 2006) certain control variables are also included in the equation which can affect the firm value. The first control variable is *Firm size*. A company's size (*Firm Size*) is measured as natural logarithm of company's assets. The second control variable is *Leverage*. The extent to which the firm is leveraged (*Leverage*) is measured as a ratio of debt to total assets. The third control variable is *Capital Expenditure*. It is measured as a ratio of capital expenditures to total assets.

Methodology

Earlier literature on corporate cash holdings showed that there exist problems of endogeneity and omitted variable bias (Drobtz and Gruninger, 2007; Ozkan and Ozkan, 2004). Endogeneity problem might arise in cash literature for several reasons. For example, random shocks influencing firms' cash holding decision can also influence other firm-specific factors, such as firms' leverage and growth opportunities. Furthermore, the observed empirical relationships between firms' cash holdings and firm-specific variables might reflect the impact of cash holdings on the latter rather than vice versa. It is essential to allow for unobserved firm-specific effects since different firm may differ in cash holdings due to several unobserved factors related to preferences, management idea, firm conditions, competition from other firms, etc. Thus, ignoring unobserved firm-specific effects is likely to result in biased parameter estimates since these effects must be expected to be correlated with observed explanatory variables. For dealing with those issues panel data techniques are used in recent literature (see, e.g. Opler *et al.*, 1999; Pinkowitz and Williamson, 2001). As discussed in Campello (2006) and Guney *et al.* (2003) a dynamic cash model is adopted for the present study and estimate it by using GMM[3] estimation method. There are two advantages of this approach. First, it is more effective in controlling for the potential endogeneity problem than fixed-effect (within) estimation method that has been widely used in earlier research. Although fixed effect estimation method controls for time-invariant unobserved firm-specific factors but it does not take into account for potential endogeneity problem. The dynamic cash model by applying GMM according to Arellano and Bond (1991) method consists of taking the first differences of the model and then applying the GMM using the lagged levels of the endogenous variables as instrumental variables. Taking first differences controls for the non-observable fixed firm effect. It is assumed that there is no serial correlation in the disturbance term and all the lagged variables can be used as valid instruments in the first difference equation (Ahmed and Javid, 2009). The Hansen test is also applied for over identifying

restrictions to investigate whether or not there is a correlation between the instruments and the error term.

First, quadratic relationship is investigated between cash holdings and firm value and for that the following equation is applied:

$$V_{it} = \beta_0 V_{it-1} + \beta_1 Cash_{it} + \beta_2 Cash_{it}^2 + \beta_3 Size_{it} + \beta_4 Leverage_{it} + \beta_5 capex_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

In Equation (1) V_{it} represents dependent variable which is Tobin's Q and its proxy MV/TA for measuring firm value. The main independent variables are cash ratio and its square term. Other variables include size which is natural logarithm of total assets, leverage is debt to total assets and capex is the ratio of capital expenditure to total assets. η_i measures unobservable heterogeneity, λ_t are the year dummy variables and ε_{it} is the error term. Equation (1) determines optimal cash level of firm i at time t . Thus, it is expected to have $\beta_1 > 0$ and $\beta_2 < 0$.

If the quadratic relationship in Equation (1) holds then there exists optimal cash level. Thus, in order to investigate how deviation from optimal cash level affects firm value, a methodology is applied which is developed by Tong (2008) and used by Martinez-Sola and Garcia-Teruel (2013). Deviations from optimal cash level are measured from the equation presented in the following equation. This equation is derived from earlier literature, describing the determinants of cash holdings (see e.g. Kim *et al.*, 1998; Opler *et al.*, 1999):

$$Cash_{it} = \beta_0 Cash_{it-1} + \beta_1 Cash_{flow_{it}} + \beta_2 Liquidity_{it} + \beta_3 Size_{it} + \beta_4 Leverage_{it} + \beta_5 Div\ dummy_{it} + \beta_6 Capex_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where cash is the main dependent variable other variables include lagged cash term, cash flow which is measured as net operational income plus depreciation to total assets, liquidity is taken as a ratio of net working capital to total assets. Size is the natural logarithm of total assets, leverage is debt to total assets, dividend dummy takes the value of 1 for firms who pay dividend and 0 otherwise and capex is the ratio of capital expenditure to total assets. η_i measures unobservable heterogeneity, λ_t are the year dummy variables and ε_{it} is the error term.

Deviations derived from Equation (2) are plugged in place of cash and cash (square) variables in Equation (1) and the equation is presented below:

$$V_{it} = \beta_0 V_{it-1} + \beta_1 Deviation_{it} + \beta_2 Size_{it} + \beta_3 Leverage_{it} + \beta_4 capex_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (3)$$

where V_{it} represents firm value measured as Tobin's Q and MV/TA. Independent variables include lagged value of dependent variable (Tobin's Q and MV/TA), deviation is taken as absolute value of residuals derive from Equation (2). Size, leverage and capex are the control variables as defined earlier. It is expected that $\beta_1 < 0$ in Equation (3) in order to imply a negative relation between deviations from the optimal cash level and firm value.

In Equation (4) an interaction term is added in order to see which deviations (above or below) the optimal level affects firm value. It is defined as residual dummy

multiplied by deviation. Residual dummy takes the value of 1 for positive residuals and 0 otherwise:

$$V_{it} = \beta_0 V_{it-1} + \beta_1 Deviation_{it} + \beta_2 interaction\ term_{it} + \beta_3 Size_{it} + \beta_3 Leverage_{it} + \beta_4 capex_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (4)$$

where V_{it} is measured as Tobin's Q and MV/TA . Main independent variables are $Deviation_{it}$ which is measured as absolute value of residuals and interaction term (residual dummy \times deviation), where residual dummy takes the value of 1 for positive residuals and 0 otherwise. Others are control variables as described earlier. It is expected that $\beta_1 < 0$ and $(\beta_1 + \beta_2) < 0$ because they are capturing the effect of above and below optimal level deviations. When the residuals are positive residual dummy will take the value of 1 and its effect on firm value is explained by $(\beta_1 + \beta_2)$. However, when residuals are negative above optimal variable takes the value of 0, thus interaction term will also be 0 and the effect is explained by β_1 .

Empirical Results

Table I shows descriptive statistics of the dependent and independent variables used in the study. The main variable of interest is cash whose mean value is 10 percent and median is 3.4 percent. The mean cash ratio found here is much closer to other related studies (see e.g. Kim *et al.*, 1998; Shah, 2010; Ozkan and Ozkan, 2004). This finding describes that cash holdings in Pakistan are quite high, like in other developed economies. Table I also shows that among 261 sample firms 10 percent of them hold <1 percent of cash and the other 10 percent hold more than 30 percent of the cash. Other variables show that an average firm has 5 percent of its assets invested in capital expenditures with a median of 3 and 58.8 percent of a firm's assets come from debt, with a median of 62 percent. This, finding reveals that Pakistani firms are highly leveraged firms (Aftab, 2009). Average market valuation measure from Tobin's Q is 1.1058.

Table II describes the correlation among the variables. Results of correlation matrix show significant correlation coefficients among independent variables including size, leverage and capital expenditure. Although correlation coefficients are significant but they are not high enough which can cause the problem of multicollinearity[4].

	Mean	Median	SD	10th Percentile	90th Percentile	<i>n</i>
Tobin's Q	1.1058	0.9477	0.604	0.648241	1.755907	1,566
MV/TA	0.5174	0.2832	0.6446	0.059228	1.233646	1,566
Cash	0.1001	0.0346	0.1525	0.002378	0.306284	1,566
Size	7.4397	7.2904	1.4991	5.654732	9.446745	1,566
Leverage	0.5883	0.6218	0.2004	0.287962	0.816927	1,566
Capex	0.0587	0.0314	0.2198	-0.07191	0.221012	1,566

Notes: The table provides descriptive statistics of variables used in the study. The variables are Tobin's Q measure as a ratio of market value of equity plus book value of debt to book value of equity, MV/TA measure as a ratio of market value of equity to book value (BV) of total assets, cash is the ratio of cash and cash equivalent to book value of total assets, size is the natural log of total assets, leverage is the ratio of total debt to total asset, Capex is the ratio of capital expenditure to total assets

Table I.
Descriptive statistics

	Cash	MV/TA	Tobin's Q	Size	Leverage	Capex
Cash	1					
MV/TA	0.315186***	1				
Tobin's Q	0.218853***	0.9505***	1			
Size	0.291358***	0.143916***	0.192493***	1		
Leverage	-0.35401***	-0.35142***	-0.04312*	0.117253***	1	
Capex	0.325594***	0.169988***	0.104956***	0.131512***	-0.23032***	1

Notes: This table provides the correlation among variables used in the study. The variables are Tobin's Q measure as a ratio of market value of equity plus book value of debt to book value of equity, MV/TA measure as a ratio of market value of equity to book value of total assets, cash is the ratio of cash and cash equivalent to book value of total assets, size is the natural log of total assets, leverage is the ratio of total debt to total asset, Capex is the ratio of capital expenditure to total assets. ***, **, *Coefficients significance level: 1, 5 and 10 percent, respectively

Table II.
Correlation matrix

Multicollinearity can lead to the insignificance of independent variables which are in fact significant.

Table III shows the estimation results of Equation (1). As expected cash is positive and significant at 1 percent while cash (square) term is negative and significant at 5 percent [5]. This indicates a concave association between cash holdings and firm value for Pakistan. The negative coefficient with cash (square) variable shows the cutoff point (optimal level) after which holding cash balances become detrimental for firm value. Figure 1 shows that equity investors value cash holdings at a decreasing rate until the optimal level is reached which is the top point of the curve denoted by point C. Another proxy of firm value (MV/TA) is also considered which further confirms the same result. These results confirm the findings of earlier studies on cash holdings, which have implicitly assumed the existence of optimal cash holdings (Kim *et al.*, 1998;

	Tobin's Q	MV/TA
Lagged dependent variable	-1.01543*** (0.0001)	-1.04256*** (0.00)
Cash	12.61541*** (0.0091)	13.84237** (0.0487)
Cash(sq)	-15.8652** (0.018)	-14.049** (0.0438)
Size	-0.28552 (0.4352)	-0.61308 (0.1343)
Leverage	2.840081 (0.3341)	3.63489 (0.1601)
Capex	0.72327* (0.0695)	0.216822 (0.3498)
Hansen Test (df)(probability)	7.27228 (6)	7.922947 (7)
	0.500	0.250
Firms	261	261
Observations	1,566	1,566
Estimation period	2003-2008	2003-2008

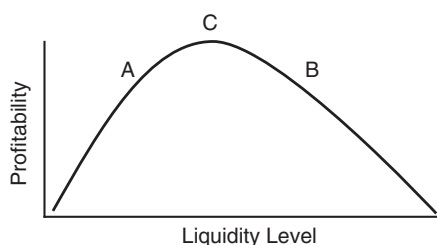
Notes: This table provides the estimation output of Equation (1) done through two step GMM estimator. In column 1 the dependent variable is Tobin's Q and in column 2 the dependent variable is MV/TA. Lagged values of dependent variables are implied as regressors, cash and cash (square) measure cash holdings. Size, leverage and capex are used as control variables. Time dummies are included in all regressions. Hensen test of over identifying restriction is implied with null hypothesis of instrument validity. *p*-values are reported in parenthesis, where ***, **, * indicate coefficients significance level: 1, 5 and 10 percent, respectively

Table III.
Quadratic relationship
between cash holdings
and firm value

Opler *et al.*, 1999). Furthermore, this finding is also consistent with Martinez-Sola and Garcia-Teruel (2013), which found the existence of optimal cash level for a sample of US industrial firms. Among control variables size and leverage are not found significant while capital expenditure is significant at 10 percent. Lagged value of independent variable is found highly significant in both the cases.

Table IV shows the result of Equation (3). It is confirmed from the results of Equation (1) that quadratic relationship exists between cash holdings and firm value, i.e. the presence of optimal cash level. Now the next objective is to investigate whether deviations (residuals of Equation (2)) from optimal level affect firm value or not. Deviations are the area above and below the optimal level. Figure 1 shows deviation as A and B. As expected Table IV shows that coefficient of absolute value of deviations are negative and significant for firm value and its proxy which confirms the hypothesis that deviations from optimal cash level decreases firm value. In Table IV deviations are not distinguished as positive and negative but rather they are taken in absolute values.

Results of Equation (4) are presented in Table V. It is confirmed from the results of Equation (3) that an optimal level of cash holdings exists and deviation from that level



Source: Michalski (2010a,b) and Hundley (1996)

Figure 1. Relationship between profitability and liquidity level

	Tobin's Q	MV/TA
Lagged dependent variable	-0.55077*** (0.00)	-0.56481*** (0.00)
Deviation	-1.92003* (0.0644)	-1.57847* (0.0782)
Size	-1.50738*** (0.00)	-1.62713*** (0.00)
Leverage	-2.79799 (0.2759)	-2.25844 (0.3263)
Capex	0.302809** (0.0292)	0.247048** (0.022)
Hansen Test (df) (probability)	6.340864 (5)	6.52369 (5)
	0.250	0.250
Firms	261	261
Observations	1,566	1,566
Estimation period	2003-2008	2003-2008

Notes: This table provides the estimation output of Equation (3) done through two step GMM estimator. In column 1 the dependent variable is Tobin's Q and in column 2 the dependent variable is MV/TA. Lagged values of dependent variables are implied as regressors, deviation is the absolute value of residuals drawn from Equation (2). Size, leverage and capex are used as control variables. Time dummies are included in all regressions. Hensen test of over identifying restriction is implied with null hypothesis of instrument validity. *p*-values are reported in parenthesis, where ***, **, * indicate coefficients significance level: 1, 5 and 10 percent, respectively

Table IV. Relationship between deviations from optimal cash level and firm value (I)

	Tobin's Q	MV/TA
Lagged dependent variable	-0.4297*** (0.00)	-0.42686*** (0.00)
Deviation	-1.24839* (0.0669)	-1.41543* (0.0768)
Residual dummy × deviation	1.088153** (0.0198)	1.370283* (0.0608)
Size	-1.00072*** (0.0026)	-1.28298*** (0.0007)
Leverage	-0.78234 (0.475)	-0.97504 (0.3517)
Capex	0.159067 (0.1005)	0.080456 (0.4059)
Hansen Test (df) (probability)	17.18104 (10)	15.5441 (9)
	0.05	0.05
Firms	261	261
Observations	1,566	1,566
Estimation Period	2003-2008	2003-2008

Notes: This table provides the estimation output of Equation (4) done through two step GMM estimator. In column 1 the dependent variable is Tobin's Q and in column 2 the dependent variable is MV/TA. Lagged values of dependent variables are implied as regressors. Deviation is the absolute value of residuals drawn from Equation (2) (residual dummy × deviation) is the interaction term in which resid dummy is the dummy variable which takes the value of 1 for positive residuals and 0 otherwise. Size, leverage and capex are used as control variables. Time dummies are included in all regressions. Hensen test of over identifying restriction is implied with null hypothesis of instrument validity. *p*-values are reported in parenthesis, where ***, **, * indicate coefficients significance level: 1, 5 and 10 percent, respectively

Table V.
Relationship between
deviations from optimal
cash level and firm
value (II)

affects firm value. Now the aim is to find out whether deviations on either side, i.e. above or below the optimal level of cash, affect firm value negatively or not. Results showed that coefficient of deviation term which represents the effect of cash holdings when they are below optimal level is negative and significant for both Tobin's Q and its proxy. This result confirms that firm value is affected negatively when cash holdings are below optimal level. This result is consistent with the explanation that investors want firms to hold sufficient amounts of cash so that they will be able to keep investing when internal funds are low relative to investment and when outside funds are expensive, related to precautionary motive of holding cash. This explanation is consistent with the findings of Chan *et al.* (2011) and Pinkowitz and Willimson (2007) that investors give higher marginal value to the cash holdings in firms with higher growth rates and a higher level of uncertainty in their cash flows. Furthermore, Chan *et al.* (2011) also found that costly external financing forces firms to save more cash for current operating and future investing needs and investors are aware of these cash hoarding policies and view them positively. Furthermore, the interaction term (residual dummy × deviation) which represents deviations above optimal level is also positive and significant. This is because negative and positive residuals cancel the effect of each other (Tong, 2008). Here, the interest is in the sum of coefficients ($\beta_1 + \beta_2$) which is < 0 as expected. This result confirms the other hypothesis that deviations above the optimal level also have negative impact on firm value. This is because excess cash beyond optimal level can lead managers to invest in value-decreasing projects, especially when governance practices are weak. Earlier studies have shown that shareholders value cash holdings substantially less if a firm has poor governance. Those firms dissipate excess cash reserves more quickly on less profitable investments than firms with good governance (Dittmar and Marth-Smith, 2007; Kusnadi, 2011). Pinkowitz *et al.* (2006) have found similar results internationally.

For all regression specifications, Hansen (1982) χ^2 -test statistic shows that for the null hypothesis the equation's over identifying restrictions are valid, i.e. the estimated orthogonality conditions are sufficiently close to zero.

Overall, it can be said that all results support the hypothesis. An optimal cash level exists for firms in Pakistan. This result is consistent with earlier studies like Opler *et al.* (1999) and Drobetz and Gruninger (2007) which describe that firms have target cash ratios to which they adjust periodically. This study gives additional evidence that when firms achieve that optimal (target) level investors value them positively. The study provides a theoretical model for the existence of an optimal level of cash. Optimal level of cash holdings is neither a particular number that can be applied for all the firms, nor is only a function of equity investor preferences. Different type of stakeholders will have different risk preferences, and each firm has a unique mix of stakeholders, therefore there is not one optimal level of cash holdings. The true optimal level of cash holding for each firm depends on other stakeholders and other factors beyond the equity valuation.

Furthermore, if a firm goes above or below the optimal cash levels it will affect its value negatively. Consistent with theoretical motives associated with cash holdings at levels below optimal cash holdings there are costs like transaction cost, financial distress cost and the cost of forgoing good growth opportunities which induces investors to value a firm negatively. At levels above optimal cash costs like opportunity cost and agency cost of managerial discretion are prominent, due to which investors discount firm value. Studies have confirmed that agency problems are quite severe in Pakistan due to concentrated family ownership structures and weak law enforcement (La Porta *et al.*, 1998; Cheema, 2003). Moreover, Ghani and Asharf (2004) showed that investors value less those Pakistani firms which are affiliated with business groups as compared to the ones which are not affiliated with business groups because they are viewed as having lower transparency and weaker governance. This explanation further confirms why investors value Pakistani firms negatively when their cash levels go beyond optimal levels. Similarly, weak governance and agency problems have trickle-down effect and it ultimately affects capital market development because outside investors are unwilling to finance when their rights are not well protected (La Porta *et al.*, 2002; Javed and Iqbal, 2007).

Conclusion

The present study is based on the notion that if there are costs and benefits associated with holding too much or too little cash then there is an optimal level of cash where marginal costs are offset by marginal benefits. This is the point where firm's value is maximized. In order to examine the optimal relationship between cash and firm value first the concave relationship is determined. If that relationship holds then it is investigated as to how deviation affects firm value. For the concave relationship to hold cash and cash square terms are included in the equation and negative sign is expected with cash square term. As expected, positive and significant relationship is found with cash and negative and significant relationship is found with its square term. Next, following Tong (2008) methodology a residual and interaction term is included in the equation in order to determine whether deviations on either side of optimal cash level decreases firm value and the results confirmed that. All the analysis is done by using Arellano and Bond's (1991) GMM two-step estimator.

Prior research showed a dark side of cash holdings by arguing that entrenched managers used them in ways that destroy value (see Harford *et al.*, 2004;

Dittmar Marth-Smith, 2006). In contrast, there are studies which argued that cash reserves can benefit shareholders by allowing firms to take efficient growth projects (see Opler *et al.*, 1999). The results in this study add significantly to the above sets of studies by defining the existence of an optimal point of cash between costs and benefits where firm value is maximized.

The findings in this paper contribute to the burgeoning literature on cash policy. A large and growing literature documents the relationship between cash holdings and firm value in terms of governance. However, much less is understood about the direct relationship between firm value and cash holdings in the context of Pakistan. In results the negative sign with cash (square) term describes the existence of optimal or target levels of cash holdings for Pakistani firms which were previously unaddressed. The study has a number of implications. First, it has implications for firms' investment and financing decisions when deviations are below optimal cash level (deviation and interaction term) and not enough internal funds are available. Also, firms have limited access to external finance and have higher growth opportunities. The costs of holding not enough cash are consistent with trade-off theory. Due to information asymmetry and adverse selection costs external financing become costly and firms may prefer not to sell securities and even to forgo investments. Second, it has implications for agency theory and governance practices when deviations are above optimal levels of cash (deviation). Now managers have more cash available under their control and they can use it to make investments that capital markets will not be willing to finance. This situation can be avoided by practicing strict governance practices like investors' protection, corporate transparency, etc. Third, the study has implications for managers who operate firms in developing countries like Pakistan where certain problems are more evident than in developed countries. When cash levels are above optimal agency costs are prevalent and they are more pronounced due to the structure of firms[6] in Pakistan. Furthermore, at levels below optimal it is difficult for Pakistani firms to raise cash externally due to the low level of financial development. For these reasons managers in Pakistan should manage their cash balances efficiently by being around the optimal levels of cash and through which they can increase the firm value.

Future research should include variables related to precautionary and transaction cost motive in order to see how firm value is affected when cash holdings are below optimal levels. Similarly at levels above optimal, agency cost related variables must be included in the equation to see their impact. Findings are limited to the one market where this study is conducted. Further studies on more markets are encouraged so as to be able to generalize these findings to a wider literature.

Notes

1. These are the surname of two authors both started with Ozkan. Relevant reference is provided. Ozkan and Ozkan (2004).
2. Sample firms include non-financial firms comprising of manufacturing, non-financial services and retail firms listed on Karachi Stock Exchange (KSE) during the period 2003-2008. Financial firms including banks, insurance, real estate and trading firms are excluded from the sample because their cash holdings may be subject to extraneous influences, such as government regulations (Faleye, 2004).
3. For the present study Arellano and Bond (1991) difference Generalized Method of Moments (GMM) is applied which is a basically a dynamic panel data model. Estimation output of difference Generalized Method of Moments (GMM) does not report the value of intercept

(see e.g. Ozkan and Ozkan, 2004; Martinez-Sola and Garcia-Teruel, 2013). As far as coefficient of determination, R^2 and its adjusted value are concerned which are routinely used in most regression models as measure of goodness of fit and as a criterion for model selection. There are problems of using R^2 in a regression model estimated by instrumental variable methods like Generalized Method of Moments (GMM) or Two Stage Least Square (2SLS) (see e.g. Verbeek, 2008). In general there is no measure of goodness of fit in Instrumental variable (IV) except checking for validity of instruments.

4. While the significance of the magnitude of correlations remained subjective, an approximate guide of correlation is: 0.20 slight correlations, 0.20-0.40 as low correlation, 0.40-0.70 as moderate correlation, 0.70-0.90 as marked correlation and greater than 0.90 as very high correlation (Guilford, 1956; Krish, 2011). In Table II correlation coefficients among the independent variables are significant but they are not high enough (based on above criteria) to cause the problem of multicollinearity. The only high correlation is between Tobin's Q and MV/TA , which are not independent variables but proxies of each other.
5. For a nonlinear (concave) relationship to hold coefficient on cash (square) term is expected to be negative and significant. Earlier literature shows that for the existence of nonlinear relationship coefficient on square term should be negative and significant (negative coefficient means it's less than zero) (see e.g. Aghion *et al.*, 2005; Martinez-Sola and Garcia-Teruel, 2013; Chen and Gong, 2012).
6. Pakistani firms are characterized as being having concentrated ownership, family control, pyramidal structures, interlocking directorship and cross shareholdings (Cheema, 2003; Zaidi and Aslam, 2005; Javed and Iqbal, 2006).

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Further reading

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Corresponding author

Qurat-ul-ann Azmat can be contacted at: aineazmat@gmail.com

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