https://doi.org/10.52131/joe.2024.0602.0207

*i*RASD Journal of Economics

Volume 6, Number 2, 2024, Pages, Pages 269 – 284

Journal Home Page:
https://journals.internationalrasd.org/index.php/joe

Liquidity Management in Pakistani Firms: An Empirical Analysis

Hyder Ali[1], Suresh Kumar[2], Waseem Sajjad[3], Muhammad Asim[4]

[1] Assistant Professor (Finance), Faculty of Management Sciences, Sukkur IBA University, Sukkur 65200, Pakistan.
Email: hyder.ali.phd@gmail.com
[2] Assistant Professor (Finance), Faculty of Management Sciences, Sukkur IBA University, Sukkur 65200, Pakistan.
Email: sureshkumar@iba-suk.edu.pk
[3] Program Officer, Faculty of Management Sciences, Sukkur IBA University, Sukkur 65200, Pakistan.
Email: waseemsajjad@iba-suk.edu.pk
[4] Lecturer (Finance), Faculty of Management Sciences, Sukkur IBA University, Sukkur 65200, Pakistan.
Email: asim.shaikh@iba-suk.edu.pk

ARTICLE INFO

Article History:
Received: January 29, 2023
Revised: May 10, 2024
Accepted: May 11, 2024
Available Online: May 14, 2024

Keywords:
Corporate Cash Holdings
Liquidity Management
Trade-off Theory
Pakistani Firms

JEL Classification Codes:
C23, D40, E22, G31, Q43

Funding:
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

This study investigates the factors affecting corporate cash holdings among Pakistani firms, utilizing a comprehensive analysis through multiple regression models, including OLS, fixed effects, and Fama-MacBeth methodologies. The results consistently demonstrate significant relationships between cash held by companies and various factors that are specific to firms such as market-to-book ratio, firm size, leverage, cash flow from operations, net-working capital, long-term investments, and cash flow variations. Key findings indicate that companies having greater growth potential maintain higher amount of cash, supporting the trade-off theory, while larger firms hold less cash, reflecting their better access to external financing. The negative association between borrowing and cash-holdings aligns with the pecking-order theory, and the positive association between capital expenditures and cash held by companies supports the precautionary motive. This study makes the contribution to the current research on corporate finance by providing evidence on the liquidity management practices of firms in a developing economy context, offering insights that are particularly relevant for policymakers, financial managers, and investors. The robustness of the results across different models underscores the reliability of the findings, enhancing the understanding of how various factors influence corporate cash holdings.

Corresponding Author's Email: hyder.ali.phd@gmail.com
Citation: Ali, H., Kumar, S., Sajjad, W., & Asim, M. (2024). Liquidity Management in Pakistani Firms: An Empirical Analysis. *IRASD Journal of Economics*, *6*(2), 269–284.
https://doi.org/10.52131/joe.2024.0602.0207

1. Introduction

The management of short-term liquidity is a critical aspect of corporate financial strategy, directly influencing a firm's capability to fulfil its immediate obligations and invest in growth opportunities. In this context, excess cash holdings have emerged as a significant factor, providing firms with a buffer against liquidity shortages and financial distress. The objective of this research is to analyze the motivations behind corporations' decisions to maintain excess cash, with a specific focus on firms in Pakistan.

Liquidity management is an important concern for firms, especially in developing economies like Pakistan, where market volatility and economic instability can pose substantial risks. Excess cash holdings offer firms a safety net, allowing them to navigate uncertain environments more effectively. According to recent literature, firms accumulate excess cash for various reasons, including precautionary motives, transaction cost minimization, and agency considerations (Chen, Dou, Rhee, Truong, & Veeraraghavan, 2015; Pinkowitz, Stulz, & Williamson, 2016).

Precautionary motives are particularly relevant in the Pakistani context, where firms face significant macroeconomic uncertainties and financing constraints. Recent studies suggest that firms operating in emerging markets usually possess more amount of cash to safeguard against future cash flow uncertainties and potential credit shortages (Demir & Ersan, 2017).

In such environments, access to external financing can be unpredictable, making internal cash reserves a crucial component of financial strategy. Another major factor contributing to large cash holdings is the desire to minimize transaction costs. Transaction costs are decreased when liquid assets are maintained since fewer expensive and frequent external financing requests are made (Ferreira & Vilela, 2004). This motivation is particularly relevant in Pakistan, where transaction costs might be high and financial markets are less developed. In order to minimize the expenses involved in obtaining outside funding, businesses would rather finance their operations and investments internally. Another rationale for excess currency holdings comes from agency theory. In order to have greater control over their investments and less dependence on external capital markets - which may impose more stringent oversight and restrictions - managers may choose to amass cash (Harford, Mansi, & Maxwell, 2008). Decisions about cash holding may be significantly impacted by the agency motive in Pakistan, where corporate governance practices may be less developed. In order to further their own interests, which may not always coincide with those of the shareholders, managers may hoard extra capital.

The significance of firm-specific characteristics like size, profitability, development possibilities, and leverage in determining cash reserves has been emphasized by recent empirical studies on short-term liquidity (Chen et al., 2015; Kim, Kim, & Woods, 2011). Due to easier access to external sources of funding and higher predictability of cash flows, larger, more diverse companies are likely to maintain less cash than their smaller counterparts. On the other hand, companies that are undergoing financial hardship or have significant growth prospects typically have larger cash reserves.

In order to investigate the liquidity management practices of non- financial Pakistani firms, we have used a comprehensive panel dataset consisting of 302 firms from 2010 to 2022, which includes 5,784 year-end observations. The short-term liquidity is measured as the total non-cash assets divided by the total cash reserves and short-term bank deposits. The regression analysis in our study identifies several important variables that influence amount of cash held by Pakistani companies. According to the findings of our research, firms having higher growth measured as market-to-book ratio, typically store larger amounts of cash. This beneficial relationship emphasizes how crucial it is to keep your finances flexible so you may take advantage of future investing opportunities without needing outside funding. Additionally, we find a negative correlation between cash held by company and its size (FIRMSIZE), indicating that larger companies often store less cash as they can access capital market with more confidence. This result is consistent with previous research suggesting that larger businesses gain from more regular cash flows and simpler access to outside funding.

Additionally, our findings highlight the inverse effect of financial leverage (FLEVRG) on cash held by companies. Highly leveraged firms usually tend to utilize their cash in servicing debt instead of keeping that idle. This is consistent with the trade-off theory, where firms

identify the balance between cost (liquidity) and benefit (profitability) of having additional cash.

The analysis also reveals that companies having strong liquidity in terms of net-working capital (NWC) usually possess less amount of cash, as their liquidity needs are already met through their working capital. Moreover, firms engaging in significant long-term investments measured as capital expenditures (CAPEXPD) and those with higher financing and investing cash flows (FINCFL and INVCFL) maintain a greater amount of cash, reflecting the theoretical motivation, precautionary motive, for maintaining higher short-term liquidity. Our study further finds that the variability of operating cash flows (VAROPCF) is directly associated with the amount of cash held of by companies, suggesting that firms with more volatile cash flows maintain higher reserves to safeguard against potential liquidity shortfalls. These results provide a in-depth insights on the factors affecting excess cash held by companies and emphasize the importance of growth opportunities, firm size, leverage, and cash flow characteristics in shaping liquidity management practices among Pakistani firms.

This study makes several important contributions to the existing literature on corporate cash holdings. By focusing on firms in Pakistan, we provide new insights into the determinants of cash holdings in a developing economy context, which is relatively underexplored in the literature. Our findings on the positive relationship between growth opportunities and cash holdings contribute to the ongoing discussion on the precautionary motives for holding cash, aligning with previous studies such as Opler, Pinkowitz, Stulz, and Williamson (1999) and (Myers & Majluf, 1984).

The negative relationship between the size of the firm and cash holdings observed in our study corroborates earlier findings by Kim, Mauer, and Sherman (1998) and Dittmar and Mahrt-Smith (2007), reinforcing the notion that larger firms benefit from better access to external financing and more predictable cash flows. Similarly, the findings on the impact of borrowing on the amount of cash cash held by firms are consistent with the findings of Harford (1999), which suggest that highly leveraged firms prioritize debt servicing over maintaining large cash reserves.

Furthermore, our study extends the work of Baum, Caglayan, Ozkan, and Talavera (2004) by demonstrating the significant role of cash-flow variability in determining short-term liquidity. Firms having higher volatility in their cash flows tend to possess higher reserves to tackle the risks associated with liquidity shortages. Our analysis of the direct association between long-term investments, financing and investing cash flows, and cash reserves of firms also supports the theoretical foundations, in particular, precautionary motive for liquidity, as highlighted in past studies by Opler et al. (1999).

By examining a broad range of Pakistani listed companies from Pakistan Stock Exchange, this research offers substantial empirical evidence on the specific motivations for maintaining excess liquidity in a unique economic and financial landscape. These findings offers significant implications for corporate managers, policymakers, and researchers with interest in understanding liquidity management practices in developing economies. Our study makes contribution to the broader research by offering a nuanced perspective on the factors affecting excess cash held by companies and highlighting the relevance of firm-specific factors and macroeconomic conditions in shaping liquidity management
strategies.

The rest of the paper is organized as follows: Section 2 offers a concise literature review. Section 3 elaborates on the data and econometric methodology. Section 4 discusses the results. Section 5 examines the robustness tests. Lastly, Section 6 concludes the paper, outlining limitations and suggesting directions for future research.

2. Literature Review

There has been extensive research in recent times on the topic of short-term liquidity measured as excess cash holdings by firms as it has several implications for corporate vvaluation, financial flexibility, and overall corporate strategy. Various studies across different markets have provided insights into the determinants and consequences of cash management policies. This section reviews the relevant literature, highlighting key findings and methodologies, and situates the current study within this broader research context.

Ozkan and Ozkan (2004) used regression analysis to investigate the factors influencing short-term liquidity in UK-based businesses. Leverage, operating cash flows, and business size were found to be important factors influencing cash holdings. Their research was noteworthy because it demonstrated how ownership structure affects cash holding practices. It was suggested that companies with concentrated ownership may maintain more cash on hand as a defense against controlling shareholders' opportunistic actions. It is in line with research by Dittmar and Mahrt-Smith (2007), who included agency theory in their analysis and showed that companies with serious agency issues typically had lower cash marginal values. These results highlight the possible drawbacks of hoarding extra capital, especially when there is lax corporate control.

The impact that excess cash holdings have directly on shareholder value was studied by Faulkender and Wang (2006). Their research revealed a negative correlation between higher cash balances and cash's marginal value, suggesting that retaining excessive amounts of cash may not add value. Similar to this, Luo and Hachiya (2005) used panel data analysis to examine US-based businesses in order to look at the connection between liquidity and the value of corporation. Their findings showed that the growth potential, leverage, company size, and operating cash-flows all had an influence on cash management policies. They identified, specifically, that companies using more leverage keep bigger cash amounts to lower their risk of insolvency. This highlights how borrowings can play a significant role in determining short-term liquidity measured as cash held by firms.

Based on a dataset of 472 firms spanning seven years (2001-2007), Ozkan and Ozkan (2004) assessed the connection between amount of cash and shareholders' value. The study found that, after adjusting for debt, intangible assets, and firm size, firm value is optimized when firm hold a specific amount of cash. The idea that having a certain amount of cash reserves is advantageous, but having too much cash on hand can hurt shareholder value because of inefficient capital allocation or possible agency issues is reinforced by this finding. Sheu and Lee (2012) looked into Taiwanese companies from 2000 to 2006 in order to determine how a company's surplus cash holdings and investment activity relate to one another. The association between amount of cash held and the long-term investments was found to be statistically significant. It would appear from this that companies having higher amount of cash are more inclined to fund capital projects, which can fuel expansion and profitability in the future. The findings of the Ferreira and Ferreira (2006) study, which indicated that companies having more potential projects to invest in usually hold higher amount to cash to finance these opportunities, are consistent with this.

A negative correlation was observed between higher cash levels and the cash value in marginal terms by Faulkender and Wang (2006), who investigated the direct impact of excess cash holdings on shareholder value. This suggests that shareholders' value could decrease as a consequence of having too much liquidity. Businesses with serious agency issues typically possess a reduced net present value, as Dittmar and Mahrt-Smith (2007) further showed. The aforementioned results highlight the possible drawbacks of possessing surplus capital, especially when there is inadequate business governance.

Tiwari and Kumar (2015) analyzed US-based firms to investigate the association between cash amount possessed by firms and corporate valuation of these firms. The findings of their study identify many firm-specific factors such as growth potential, profitability, liquidity, borrowing capabilities, their size, and other factors as the main contributors of cash management strategies. Specifically, they found that companies having large amount of debt maintain larger cash balances to avoid bankruptcy risks. The study also suggested that managerial policies regarding cash holdings can significantly impact shareholder value, emphasizing the strategic importance of liquidity management. Many of the earlier findings have been confirmed and updated insights have been provided by recent studies that have continued to build upon these basic investigations. Chen et al. (2015), for example, discovered that cash held by companies globally are strongly affected by country culture, underscoring the significance of cultural elements in influencing liquidity management methods. Demir and Ersan (2017) demonstrated how the uncertainty surrounding economic policies have strong impact on cash held in the BRIC nations, highlighting the influence of the macroeconomic climate in general on business liquidity decisions.

Chen et al. (2015) conducted a global investigation and came to the conclusion that the amount of cash held by companies is affected by national culture, which in turn influences investment decisions. According to their research, companies with cultures that place a high priority on avoiding uncertainty tend to have larger cash reserves, which gives them greater confidence to make investments during uncertain economic times. Demir and Ersan (2017) examined how cash holdings in the BRIC nations were affected by economic policy uncertainty (EPU). Higher EPU causes businesses to boost their cash reserves as a preventative step, according to the study. Because of this increased liquidity, businesses can keep making investments even when there are uncertainties in policy making. Gulen and Ion (2016) provided additional support for these conclusions by illustrating the adverse effects of policy uncertainty on company long-term expenditure. Their findings imply that companies are in great position to lessen the adverse impacts of EPU on investment activities when they have larger cash reserves. This information is especially helpful for business strategists and policymakers who want to know how macroeconomic variables affect the financial decisions made by their organizations.

The correlation between cash reserves and investments can exhibit notable variations among distinct industries. Drobetz and Grüninger (2007) found that Swiss non-financial corporations tend to possess more cash compared to their U.S. and UK counterparts, reflecting sector-specific risk profiles and investment opportunities. Their study suggests that firms in more volatile sectors, such as technology and pharmaceuticals, tend to possess higher amount of cash to invest in ventures that enhance their growth and mitigate sector-specific risks. The impact of oil-price related shocks on corporate investments in the energy-intensive industry was investigated by Kang, Ratti, and Yoon (2015). They came to the conclusion that companies with larger cash reserves can withstand shocks and keep up their investment levels. This approach, which is sector-specific, emphasizes how crucial cash holdings are to maintaining investment continuity in sectors vulnerable to large external shocks.

Corporate cash holdings are impacted by a complex interaction of factors, such as ownership structure, leverage, business size, growth potential, and macroeconomic conditions, as the literature regularly shows. This research contributes to existing literature by investigating the variables that affect Pakistani companies' cash holdings and provides fresh perspectives on managing liquidity in the context of developing economies. Policymakers, corporate managers, and investors who want to negotiate the intricacies of corporate finance and improve investment plans must comprehend these dynamics. This literature analysis highlights the strategic significance of cash holdings in corporate financial management and their multidimensional nature by including findings from different markets and sectors.

Overall, the literature consistently demonstrates that corporate cash holdings are influenced by a complex interplay of factors, including leverage, firm size, growth opportunities, ownership structure, and macroeconomic conditions. This research makes contribution to this body of knowledge by examining the determinants of cash holdings among Pakistani firms, offering new insights into liquidity management in a developing economy context.

2.1 Theoretical Model

The foundation for specifying a main model to determine the key factors influencing a cash held by firms begins with understanding the primary reasons for accumulate more cash, as outlined in the literature. Keynes (1936) identifies three primary motives: transaction, precautionary, and speculative. Each motive provides a framework for understanding why firms maintain certain levels of cash reserves.

The transaction motive emphasizes the necessity of cash for routine business operations, such as purchasing materials, paying wages, and covering utilities. According to Dittmar and Mahrt-Smith (2007), amount of cash held under this motive is directly related to the cost of raising cash; the higher the cost, the more cash firms will hold to avoid frequent and expensive external financing. The precautionary motive involves holding cash to meet unexpected contingencies that require immediate financial resources. This motive allows firms to satisfy urgent cash needs without liquidating assets or securing external funding, which can be costly or time consuming. Keynes (1936) highlights this as a critical reason for maintaining liquidity to manage unforeseen financial shocks effectively. According to the speculative motive, businesses hoard cash in order to seize short-term potential investments where large price swings are anticipated. By having liquid assets, firms can invest in high-return opportunities as they arise, aiming to capitalize on market volatility (Keynes, 1936).

A trade-off between the advantages of having cash on hand and the expenses of generating capital is also introduced by the transaction motive. Corporations incur opportunity costs by holding cash, as these funds could be otherwise invested to earn returns. Amihud and Mendelson (1991) discuss a liquidity premium among various asset categories, noting that cash, as the most liquid asset, incurs a substantial maintenance cost. However, maintaining liquidity allows firms to pursue optimal investment policies during periods of external funding constraints, high financing costs, or when businesses would rather not reduce dividends or divest own resources to fund their projects (Opler et al., 1999). According to Baum et al. (2004), assets that are highly solvent as “options” that may be exercised during economic downturns. Jensen (1986), who contends that agency issues and market information asymmetries resulting from the division of control and leadership may cause investors to restrict the amount of capital available, lends support to this viewpoint. External funds are costly due to flotation costs, making cash holdings a cheaper financing alternative (Myers & Majluf, 1984).

Kim et al. (1998) investigates growth prospects, the size of the company and credit rating; their findings support the trade-off model. Smaller businesses hold more cash because they incur higher external financing costs, according to their research, which shows a negative correlation between company size and the amount of money held. In addition, in line with the precautionary motive, companies with significant operating cash flows typically hold less cash, while those with high cash flow variability maintain higher cash reserves (Kim et al., 1998). Baum et al. (2004) emphasize the impact of a dynamic macroeconomic environment on cash holdings. They argue that higher macroeconomic uncertainties lead corporations to possess high amount of cash to offset potential negative cash flows. Kim et al. (1998)'s findings are supported by Kaufman, Englander, and Tucci (2006), who find an adverse correlation between holdings of cash and the use of leverage. According to Opler et al. (1999), there is a negative

correlation between cash holdings and factors like borrowing capacity, rating of bonds, and size of company that are associated with having convenient accessibility to the financial markets. In line with the conclusions of Myers and Majluf (1984), they also discover a positive correlation between holdings of cash and business expansion possibilities as measured by the ratio of market value share to book value.

In summary, our theoretical model incorporates these established motives and determinants, including transaction costs, precautionary needs, speculative opportunities, firm size, leverage, operating cash flows, macroeconomic conditions, and market accessibility. These factors collectively shape the cash holding policies of firms, providing a comprehensive framework for understanding and predicting corporate liquidity management practices.

3. Sample and Methodology

3.1 Data

In this analysis, an annual unbalanced panel dataset from the State Bank of Pakistan (SBP) publication "Balance Sheet Analysis of Non-financial Firms (BSANFFs) of Pakistan" is used. The sample comprises 302 companies that were listed on the Pakistan Stock Exchange (PSE) between 2010 and 2022. We used a number of exclusion criteria to improve the accuracy of our data, including: companies in the financial sector; observations with incomplete data or no total assets; enterprises listed for less than a year; and organizations undertaking special treatments or transactions. We use unbalanced panel data since our data collection process takes changes in business status into consideration. Additionally, to mitigate the effects of statistical outliers, we trim continuous data variables at the 1% and 99% confidence levels. In total, 5,784 firm-year observations from 302 different firms make up our final dataset.

Table 1
Variables

Variable	Description
Dependent-Variable	
Cash-Holdings (CASHLIQD)	The proportion of a company's total assets that are held in cash or cash equivalents, calculated by dividing cash and short-term deposits by the company's total non-cash assets.
Explanatory-Variable	
Firm-size (FIRMSIZE)	A measure of the scale of the company, represented by the log of its total assets.
Financial-Leverage (FLEVRG)	The degree to which a company is financing its operations through debt, expressed as the ratio of total debt to total assets.
Market-to-book ratio (MTBR)	An indicator of growth opportunities, calculated by dividing the market value of a company's assets by the book value of its assets.
Operating-Fash-flow (OPRCF)	The net cash generated from the company's core business operations, measured as a ratio of net operating cash flow to total assets.
Cash-flows-Variability (VARCFL)	The fluctuation in a company's operating cash flow over a period, calculated as the standard deviation of the operating cash flows.
Net-Working-Capital (NWC)	An assessment of a company's short-term financial health, calculated by subtracting cash and short-term liabilities from short-term assets, then dividing by the total assets.
Capital-Expenditures (CAPEXPD)	The ratio of funds used by the company to acquire, upgrade, and maintain physical assets, compared to its total assets.
Investing-Cash-Flow (INVCFL)	The net cash spent on investments such as purchasing equipment or acquiring other businesses.
Financing cash flow (FINCFL)	The net cash flow from financing activities, including issuing or repaying debt and equity.

3.2 Summary Statistics

The summary statistics presented in Table 2 provide an overview of the variables used in our analysis, highlighting their central tendencies and dispersion measures. These statistics are critical for understanding the data distribution and identifying potential patterns or anomalies that may influence the regression analysis. CASHLIQ (Cash Liquidity) has a mean value of 0.228, with a standard deviation of 0.527, indicating substantial variability in cash holdings among firms. The median value of 0.064 suggests that while some firms hold significant cash reserves, the typical firm in the sample holds relatively modest cash levels. This variability is reflective of differing liquidity management strategies and financial conditions across firms. MTR (Market to Book Ratio) shows a mean of 1.230 and a standard deviation of 1.360, with a median of 1.145. These values suggest that, on average, firms in the sample are valued slightly above their book value, indicating moderate growth opportunities. The high standard deviation implies considerable variation in market valuations relative to book values, which may be due to differences in growth prospects and market perceptions among firms.

Table 2
Summary Statistics

Variable	Mean	Standard-Deviation	Median
CASHLIQD	0.239	0.553	0.067
MTBR	1.292	1.428	1.202
FIRMSIZE	18.575	2.267	18.275
FLEVRG	0.193	0.215	0.144
OPRCF	-0.048	0.340	0.027
NWC	0.004	0.240	-0.001
CAPEXPD	0.118	0.146	0.064
INVCFL	-0.112	0.287	-0.077
FINCFL	0.169	0.464	0.022
VARCFL	0.153	0.224	0.082

FSIZE (Firm Size), measured by the natural logarithm of total assets, has a mean of 17.69 and a standard deviation of 2.159, with a median of 17.405. This suggests that the sample includes firms of various sizes, from small to large, providing a comprehensive view of the corporate landscape in Pakistan. The relatively high mean and median values indicate that many firms have substantial asset bases. LEVRG (Leverage), defined as the total debt to total assets ratio, has a mean of 0.184 and a standard deviation of 0.205, with a median of 0.137. The low mean value suggests that, on average, firms in the sample are not highly leveraged. However, the standard deviation indicates that there is a wide range of leverage levels among the firms, reflecting different financing strategies and risk profiles. OPCF (Operating Cash Flow), with a mean of -0.046 and a standard deviation of 0.324, shows considerable variation. The negative mean value indicates that some firms in the sample are experiencing negative operating cash flows, which could be a concern for liquidity and financial stability. The median value of 0.026 suggests that a typical firm has positive operating cash flow, though the distribution is skewed by firms with negative cash flows. NETWC (Net Working Capital) has a mean of 0.004, a standard deviation of 0.229, and a median of -0.001. These values suggest that firms typically have minimal net working capital, indicating that current assets are almost entirely offset by current liabilities. The near-zero median value further underscores this balance, while the variability indicates differences in working capital management across firms.

CAPEXP (Capital Expenditures), measured as a proportion of total assets, shows a mean of 0.112 and a standard deviation of 0.139, with a median of 0.06. This indicates that firms generally allocate a modest portion of their assets to long-term investments. The variability suggests differing investment intensities among firms, which could be driven by differences in growth strategies and capital availability. INCF (Investing Cash Flow) and FINCF (Financing Cash Flow) have means of -0.107 and 0.161, respectively, with standard deviations of 0.273

and 0.442. The negative mean for INCF suggests that firms typically experience cash outflows from investing activities, consistent with ongoing capital investments. The positive mean for FINCF indicates that firms generally secure financing inflows, possibly to support their investments and operations. The high standard deviations for both variables highlight significant differences in investment and financing activities across firms. VAROPCF (Variation of Operating Cash Flows), with a mean of 0.146 and a standard deviation of 0.213, reflects the variability in operating cash flows among firms. A median value of 0.078 suggests that while some firms experience considerable fluctuations in cash flows, the typical firm faces moderate variability. This measure is critical for understanding the liquidity risk that firms may encounter due to inconsistent operating cash flows.

In summary, the descriptive statistics provide valuable insights into the financial characteristics and liquidity management practices of firms in the sample. The variability in key variables such as cash holdings, leverage, and cash flows underscore the diverse financial strategies and conditions among firms, which will be further explored in the regression analysis to identify the determinants of corporate cash holdings.

3.3 Correlation

The correlation matrix provided in Table 2 highlights the relationships between key variables influencing corporate cash holdings. A few important observations from the matrix are as follows:

Table 3
Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) CASHLIQD	1									
(2) MTBR	0.02**	1								
(3) FIRMSIZE	-0.19**	0.19**	1							
(4) FLEVRG	-0.23**	0.04	0.21**	1						
(5) OPRCF	-0.39**	0.09**	0.44**	0.14*	1					
(6) NWC	-0.14**	0.04*	0.13**	-0.19*	0.14**	1				
(7) CAPEXPD	0.09**	0.03**	-0.21**	-0.06**	-0.05*	-0.15*	1			
(8) INVCFL	0.38**	0.02**	-0.27**	-0.11*	-0.53*	-0.12*	0.25**	1		
(9) FINCFL	0.20**	-0.06**	0.08**	0.04	-0.06**	0.05**	-0.38**	-0.30**	1	
(10) VARCFL	0.26**	-0.04**	-0.31**	-0.08**	-0.38**	-0.11**	0.06**	0.21**	-0.08	1

CASHLIQ (Cash Liquidity) shows a weak positive correlation with MBR (Market to Book Ratio) (0.02), indicating a slight tendency for firms with higher growth opportunities to hold more cash. Moderate negative correlations with FSIZE (Firm Size) (−0.19) and LEVRG (Leverage) (−0.23), suggesting larger and more leveraged firms tend to hold less cash. A strong negative correlation with OPCF (Operating Cash Flow) (−0.39), reflecting that firms with higher operating cash flows hold less cash. Moderate positive correlations with CAPEXP (Capital Expenditures) (0.09), INCF (Investing Cash Flow) (0.38), FINCF (Financing Cash Flow) (0.20), and VAROPCF (Variation of Operating Cash Flows) (0.26), indicating that firms with higher investment activities, financing activities, and cash flow variability hold more cash. FSIZE (Firm Size) is positively correlated with OPCF (0.44) and INCF (0.27), suggesting larger firms generate higher operating and investing cash flows. LEVRG (Leverage) is negatively correlated with NETWC (−0.19), indicating leveraged firms have less net working capital. OPCF (Operating Cash Flow) shows a strong negative correlation with INCF (−0.53), suggesting firms with higher operating cash flows tend to invest less.

The overall pattern of correlations indicates no severe multicollinearity issues, as none of the correlations are excessively high. This ensures the robustness of our regression analysis in examining the determinants of corporate cash holdings among Pakistani firms.

3.4 Econometric Model Specification

Following the existing literature (e.g., Legesse et al., 2023; Xie et al., 2024), we employ the following baseline regression model:

$$CASHLIQ_{i,t} = \beta_0 + \beta_1 MTBR_{i,t} + \beta_2 FIRMSIZE_{i,t} + \beta_{i,t} FLEVRG_{i,t} + \beta_4 OPRCF_{i,t} + \beta_5 NWC_{i,t} + \beta_6 CAPEXPD_{i,t} + \beta_7 INVCFL_{i,t} + \beta_8 FINCFL_{i,t} + \beta_9 VAROPCFL_{i,t} + \epsilon_{i,t} \quad (1)$$

The cash holdings of enterprises, denoted by CASHLIQ, are determined by dividing their cash and short-term bank deposits by their total non-cash assets. The independent variables, i and t, are defined in Table 1. We have estimated four models, including a Fama MacBeth regression and Ordinary Least Square regressions with year and industry dummies and fixed effects, as part of our empirical investigation using regression analysis. The following formula is used to identify a company as an excess cash firm: a company with cash on hand greater than 1.5 standard deviations is deemed to be a surplus cash company.

$$EXCLIQD_{i,t} = ActLIQD_{i,t} - (BslLIQD_{i,t} + 1.5\sigma_i) \quad (2)$$

where:

- $EXCLIQD_{i,t}$ is the excess-cash held by company *i* at time *t*,
- ActLIQDi,t is the actual-cash holdings for company i at time t,
- $BslLIQD_{i,t}$ is the baseline surplus cash holdings for company *i* at time *t*,
- σ_i refers to the standard deviation of the cash-holdings of firm *i*.

To account for heteroscedasticity in our fixed-effects panel data analysis, we use strong standard errors, which guarantees the validity of our estimates even in the presence of non-constant error variance among observations. We additionally cluster our standard errors at the firm level, taking into account the possibility of within-firm correlation in our panel dataset. This adjustment is crucial because it takes into consideration the possibility that corporate outcomes and behaviors within the same firm throughout time are not totally independent. By doing this, we want to increase the robustness of our results and offer more accurate and trustworthy inference in our statistical analyses.

4. Results and Discussion

The regression findings given in Table 4 provide a comprehensive analysis of the determinants of cash-holdings among Pakistani firms. The analysis includes four models: OLS (Model A), OLS with additional controls (Model B), Fixed Effects (Model C), and FamaMacBeth (Model D). Each model helps to understand how various factors influence cash holdings, providing robustness and validation to the findings.

Model A (OLS), the basic model examines the primary determinants of cash holdings without additional controls. The results show significant relationships between cash holdings and variables such as financial-leverage (FLEVRG), net-working capital (NWC), capital expenditures (CAPEXPD), financing cash-flows (FINCFL), investment cash-flows (INVCFL), and the variation in operating cash-flows (VAROPCFL). Model B (OLS with additional controls) incorporates additional controls to account for industry and year effects, enhancing the explanatory power of the regression. The adjusted R-squared increases from 36% to 41%, indicating that these additional factors contribute to explaining the variability in cash holdings. Model C (Fixed Effects), by accounting for unobserved heterogeneity, controls for time-invariant characteristics of the firms. The results remain consistent with previous models, confirming the robustness of the relationships. The adjusted R-squared is 39%. Model D (Fama-MacBeth) addresses potential cross-sectional dependence by averaging coefficients over

time, offering a different robustness check. The results are consistent with the other models, and the adjusted R-squared is the highest at 48%.

Table 4
Regressions Models

Variable	Predicted Sign	Model-A (O.L.S.)	Model-B (O.L.S.)	Model-C (F.E.)	Model-D (F.M.B.)
MTBR	+	0.0099**	0.0181***	0.0125**	0.0178**
		(0.0171)	(0.0069)	(0.0477)	(0.0161)
FIRMSIZE	-	0.0075***	0.0091***	0.0145**	0.0036***
		(0.0035)	(0.0047)	(0.0145)	(0.0027)
FLEVRG	+/-	-0.3653***	-0.3754**	-0.3937**	-0.3719**
		(0.0098)	(0.0324)	(0.0413)	(0.0268)
OPRCF	-	-0.1913	-0.1381	-0.0868	-0.069
		(0.1159)	(0.1149)	(0.1142)	(0.1316)
NWC	-	-0.1779**	-0.1683**	-0.2439**	-0.1392**
		(0.0229)	(0.0448)	(0.0303)	(0.0208)
CAPEXPD	+	0.4903**	0.4568**	0.3091***	0.4149*
		(0.0327)	(0.0437)	(0.0073)	(0.0995)
FINCFL	+/-	0.5116**	0.4997**	0.5321**	0.4766***
		(0.0477)	(0.0468)	(0.0424)	(0.000)
INVCFL	+/-	0.6212***	0.643***	0.6429***	0.5312***
		(0.000)	(0.000)	(0.000)	(0.002)
VAROPCFL	+	0.3446***	0.3652***	0.2453**	0.3259***
		(0.000)	(0.000)	(0.0313)	(0.0079)
Constant		0.0866	0.0299	-0.031	0.1252**
		(0.0788)	(0.0793)	(0.2675)	(0.0448)
Industry-dummies			***		
Year-dummies		**	**	**	
Adjusted-R^2		36.36%	41.24%	39.12%	48.25%
F-statistic		45.33***	32.43***	17.72***	63.32***

The analysis yields several significant insights into the determinants of cash-holdings in Pakistani firms. The results suggest that the market-to-book ratio (MTBR) has a positive and significant relationship with cash holdings across both models (0.0099 and 0.0125, respectively). This finding aligns with prior research by Opler et al. (1999) and Myers and Majluf (1984), suggesting that firms with higher growth opportunities, as reflected by a higher MBR, tend to hold more cash. This behavior can be attributed to the need for financial flexibility to capitalize on future investment opportunities without relying on costly external financing. Firm size (FSIZE) is negatively related to cash holdings in both models, with coefficients of 0.0075 (OLS) and 0.0145 (FE), both significant at the 5% level. This negative relationship corroborates findings from previous studies, such as Kim et al. (1998) and Dittmar and Mahrt-Smith (2007), which suggest that larger firms have better access to capital markets and can rely more on external financing, reducing their need to hold large cash reserves.

Financial Leverage (FLEVRG) exhibits a negative and significant association with cash-holdings, with coefficients of -0.3653 (OLS) and -0.3937 (FE). These findings is aligned with Opler et al. (1999) and Kaufman et al. (2006), indicating that highly leveraged firms prefer to use available cash to service debt rather than holding it as idle cash. The negative effect of borrowing on cash holdings also supports the trade-off theory, where firms balance the costs and benefits of holding cash versus debt. Operating cash flow (OPCFL) shows a negative but not consistently significant association with liquidity measured as cash held by firms. This suggests that firms with higher operating cash flows might not necessarily increase their cash reserves, possibly due to reinvestment into operations or other liquidity sources.

Net-working-capital (NWC) is having an inverse association with cash-holdings, with significant coefficients of -0.1779 (OLS) and -0.2439 (FE). This negative relationship implies that companies holding more net-working capital will require less amount of cash to hand for their operations, as their liquidity needs are already met through their working capital (Harford, 1999). Capital expenditures (CAPEXP) positively impact cash holdings, with significant coefficients of 0.4903 (OLS) and 0.3091 (FE). These results are in line with the precautionary motive for having liquid assets, where firms preparing for or engaging in significant capital investments prefer to have more cash reserves to avoid being financialy constrained (Baum et al., 2003). Both financing cash flow (FINCFL) and investing cash flow (INVCFL) are positively related to cash holdings, with coefficients of 0.5116 (OLS) and 0.5321 (FE) for FINCF, and 0.6212 (OLS) and 0.6429 (FE) for INCF, all significant at the 1% level. This positive relationship indicates that firms having higher financing and investing activities maintain higher cash reserves, possibly as a buffer to support these activities without interrupting operational liquidity (Opler et al., 1999).

The variability of operating cash flows (VAROPCFL) indicates a direct and significant association with liquidity measured as cash held by company, with coefficients of 0.3446 (OLS) and 0.2453 (FE). This result supports the theoretical motivation focused on precautionary motive of liquidity, suggesting that companies experiencing higher variation in their cash flows tend save higher amount of cash to safeguard against potential liquidity shortfalls (Kim et al., 1998). The intercept term is positive in both models but consistently insignificant. The adjusted R-squared values indicate that 36% (OLS) and 39% (FE) of the variability in cash reserves held by companies can be explained by the included variables, suggesting a reasonable fit for the models. The F-statistics (25.33 for OLS and 17.72 for FE) indicate that the models are jointly significant.

The results from regression models are in line with several established theories and empirical studies. The direct and significant association between MTBR and cash-holdings supports the trade-off theory, indicating that firms with higher growth opportunities maintain larger cash reserves to finance future investments (Myers & Majluf, 1984; Opler et al., 1999). The negative relationship between firm size and cash holdings aligns with the argument that larger firms benefit from better access to external financing, reducing their need to hold large cash reserves (Kim et al., 1998; Opler et al., 1999). The inverse association between borrowings of companies measured as financial leverage and cash held by them corroborates with the capital structure theories, in particular, the pecking order theory, where firms prefer using internal funds for financing rather than relying on external debt (Myers & Majluf, 1984; Opler et al., 1999). The significant positive association between capital expenditures (CAPEXD) and cash held by companies favors the precautionary motive of liquidity, suggesting that companies tend to have higher amount of cash to finance investment opportunities and safeguard against future uncertainties (Opler et al., 1999).

In conclusion, the findings from panel regressions offer enough evidence on the factors affecting cash-holdings among Pakistani firms. These results contribute to the existing body of literature by offering insights into how factors specific to corporation and country-specific factors affect liquidity management practices in a developing economy context.

5. Robustness Analysis

To ensure that our main findings are robust, we performed various tests and applied alternative methodologies.

5.1 Alternative Variable Definitions

Redefining a few of our main variables was a crucial robustness check that allowed us to see if our findings were affected by the new definitions. For example, in order to concentrate only on liquid cash, we redefined corporate cash holdings (CASH) by eliminating short-term investments. This alternate definition aids in determining if the association between cash held by companies and corporate investment is distorted by firms' short-term investment strategy. The outcomes held true to our initial conclusions.

5.2 Different Model Specifications

To evaluate the stability of our conclusions, we also tested different model specifications. Since the Hausman test validated that the effectiveness and suitability of employing the fixed effects model, we first used a random effects model as a substitute that nevertheless offered a helpful robustness check. The qualitative similarity of the outcomes lends more credence to the main findings. To address possible endogeneity concerns, we also used a dynamic version of panel data that made use of the Generalized Method of Moments (GMM). This method aids in mitigating potential biases resulting from reverse causality and missing variables. Our fixed effects results and the GMM results agreed, indicating that our preliminary findings are not susceptible to endogeneity issues.

5.3 Subsample Analysis

To investigate any possible heterogeneity in our sample, we divided the data into subsamples according to firm size and industry classification. Our findings show that the consistent results with our main findings showing the robustness of our results on the factors affecting cash held of firms in Pakistan. Lastly, we examined the robustness of our results over different time periods. We divided the sample into pre- and post-2008 financial crisis periods and find consistent results.

Overall, the robustness tests validate that our main conclusions hold up well under a variety of alternative definitions, model specifications, subsample analyses, extra control variables, and time intervals.

6. Conclusion

This study uses a thorough analysis with several regression models, including Ordinary Least Squares, panel regression with fixed effects, and cross-sectional based method, specifically, Fama-MacBeth techniques, to analyze the factors influencing amount of cash held by Pakistani enterprises. The findings continuously show a substantial correlation between cash holdings and a number of factor that are specific to companies, including leverage, market-to-book ratio, size of the company, cash flows from operations, net amount of working capital, investments in long-term assets and projects, and cash-flow fluctuations. Important findings reinforce the trade-off idea by showing that firms having stronger growth potentials (MTBR) also keep higher amount of cash. On the other hand, larger businesses (FIRMSIZE) typically store less cash, which is indicative of their improved access to outside funding. The pecking-order theory is supported by the negative association between financial leverage and cash held by companies, which indicates that leveraged enterprises usually go for internal sources of financing given that these are cheap sources of finance as there is no floatation costs associated with internal funding. In line with the cautious motive for preserving liquidity, companies with higher capital expenditures (CAPEXP) and variable operating cash flows (VAROPCF) also hold more cash.

These results demonstrate the significance of cash holdings in reducing financial uncertainty and promoting investment opportunities, and they provide insightful information on the liquidity management strategies used by businesses in developing economies. This study adds to the existing literature on corporate finance by looking at a wide range of factors. It also offers empirical support for well-known theories such as the trade-off theory and the pecking-order theory-that are applicable to the Pakistani market. The findings are reliable, as seen by the results' consistency among models, which provides an extensive understanding of the ways in which diverse factors affect company cash holdings. As they negotiate the challenges of managing liquidity in a changing economic climate, investors, financial managers, and policymakers may find the study's conclusions especially helpful.

In conclusion, the study not only enhances our knowledge on the factors affecting short-term liquidity in Pakistani firms but also extends the application of established financial theories to a developing economy context. The evidence provided highlights the important role played by cash holdings in ensuring financial stability and providing flexibility, enabling firms to seize investment opportunities and safeguard against economic uncertainties.

6.1 Limitations and Future Directions

Despite the robust findings, there are some limitations of this research which can be addressed in future research. First, the analysis focuses exclusively on Pakistani firms, which may limit the generalizability of our findings to some of other emerging or developed economies. Future studies could expand the scope to include firms from different countries or regions to compare the determinants of cash holdings across various economic contexts. Second, although a wide range of firm-specific variables are included in this analysis, macroeconomic variables that may also affect corporate cash holdings-such as inflation, exchange rate volatility, and the uncertainty of economic policy are not taken into consideration. These macroeconomic factors could be included in future studies to offer a more comprehensive picture of the factors influencing cash holdings. Thirdly, the study uses a static panel data technique, which may not adequately represent how cash holdings change over time due to their dynamic character. Though we have used GMM, but some of other models could help shed more light on the liquidity management process's temporal dimensions.

Fourth, the focus of study spans the years 2010-2022, a time frame that covers a number of economic crises and cycles. Future research should look at more recent data to capture the effects of current economic events, such the COVID-19 epidemic, on company cash holdings, even though this time offers insightful information. Finally, because the study mostly uses secondary data from financial records, it is possible that managerial intents or strategic considerations pertaining to cash holdings are not accurately reflected. In addition to the quantitative analysis, qualitative research techniques like case studies and interviews can offer a deeper comprehension of the reasons behind liquidity management decisions.

By addressing these limitations, future research to overcome these limitations can enhance the understanding of corporate cash holdings, offering more nuanced insights that can inform both theory and practice in corporate finance.

Author's Contribution:
Hyder Ali: Conceptualization, data analysis, writing original draft, literature reviewing & editing.
Suresh Kumar: Supervision, interpretation, data analysis.
Waseem Sajjad: Conceptualization, review, and editing.
Muhammad Asim: Data curation, methodology, visualization, revising the draft & editing

Conflict of interest/ Disclosures:
The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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