

# Determinants of Corporate Cash Holdings

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## Abstract

This article aims at examining the financial determinants of corporate cash holdings. The study employs panel data regression method. It uses the fixed-effects method based on Hausman test results for the estimation of panel data model. This study has implications that are beneficial for the business managers to have a better understanding and appreciation of the role and importance of the determinants of corporate cash holdings in formulating and evaluating the corporate financial policies. The results of the study indicate a strong positive relationship between cash holdings and cash flow, dividend payment, market-to-book ratio, net debt issuance and net equity issuance of the sample firms. It is also found that the cash holdings of these firms are negatively affected by net working capital, leverage, research and development expenditure as well as capital expenditure of the firm. The article will help researchers as well as managers to understand as to what motivates the firms to hold cash, given the fact that despite being often termed as a non-earning asset, firms generally hold more cash than their normal working capital requirement.

## Keywords

Corporate cash holdings, panel data regression, fixed-effects model

## Introduction

Cash is held by firms regardless of the nature of business they are in. It is the lifeblood of a firm. Although often termed as a non-earning asset, cash is perhaps the most critical and liquid current asset. While the amount of cash held by a firm at any given point in time may essentially be a function of the firm's working capital policy and is also a very small proportion of its current assets, it is observed that firms generally hold more cash than their working requirement. It therefore becomes worthwhile to analyze the determinants of corporate cash holdings.

As is commonly known, there are three primary motives for firms to hold cash: transactional, precautionary and speculative. Holding cash can have both advantages and disadvantages. The advantages

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may include providing a cushion against financial distress and reducing dependency on external funds, besides ensuring liquidity for the firm. When firms have cash with them, they may also be able to avail trade discounts. Suppliers generally extend price discounts on an early payment by the buyer. That profitability may be negatively impacted due to its opportunity cost is the main disadvantage. Cash on its own does not earn any interest. Idle cash is also an indicator that the firm is unable to do something for the shareholders, which they cannot do for themselves. This certainly is not justified to the objective of shareholder wealth maximization. After all, it is the shareholders' money and managers are only the custodians. It therefore becomes very important for a manager to manage cash effectively so as to expedite cash receipts and delay cash disbursements to the extent possible without otherwise impacting the business. Managing float is the key to managing the cash conversion cycle.

The rationale for corporates to hold cash is explained by three existing theories, namely, the trade-off theory (Myers, 1977), the pecking order theory (Myers & Majluf, 1984) and the free cash flow theory (Jensen, 1986). As per the trade-off theory, the optimal level of cash held by a firm is determined by the trade-off between the marginal costs and marginal benefits of holding cash. Imperfections in financial markets bring in a cost to liquidity, as the borrowing rate would be higher than the lending rate. Although quantification of the trade-off is difficult, firms should strive to ensure that the benefits accruing from liquidity must be appropriately balanced with the costs involved. The pecking order theory ranks financing options as retained earnings, debt and equity, in order of their hierarchy. The free cash flow theory in some way links to agency problem as it prescribes that the cash holdings facilitate the managers to make investment decisions for the firm. Availability of cash reserves may to an extent lead managers to take decisions, which may be desirable for them but not necessarily be in the interests of the shareholders.

Although firms could have done without cash reserves in an ideal world with perfect markets, the real-life imperfections in the markets cause them to maintain a buffer to bridge the gaps in cash inflow or outflow, if any, arising out of the operating needs of the firm. And since practically all firms hold cash, more than their normal requirements, it makes sense to understand the firms' motivations for holding cash. Numerous studies have been done in this regard, which strive to explain the determinants of corporate cash holdings. While corporates may continue to decide their cash holdings depending upon the determinants which weigh the most upon them, it is important that they do not lose sight of efficient management of working capital for attaining the right trade-off between liquidity and profitability as shown by Kaur and Singh (2013).

The remaining article is structured into five sections. The second section, which follows, is an extensive survey of the literature about the research that has gone into the determinants and implications of corporate cash holdings so far. The third section outlines the data and methodology employed by us in this study. This is followed by a discussion on the results arrived at from the study in the fourth section. Finally, the fifth section builds these results into valid conclusions.

## Literature Review

Efforts have been made so far by researchers to understand the determinants of corporate cash holdings. This article attempts to review the extant literature and provide an extensive account of the major factors which the researchers would have found determining the level of corporate cash holdings.

Availability of growth/investment opportunities clearly stands out to be one of the most important determinants of cash held by the corporates. Ople et al. (1999) looked at the determinants and implications of holdings of cash and marketable securities by publicly traded US firms. Evidence supportive of a static

trade-off model of cash holdings was found in time series and cross-section tests. In particular, firms with strong growth opportunities and riskier cash flows held relatively high ratios of cash to total non-cash assets. Ferreira and Vilela (2004) investigated the determinants of corporate cash holdings in the Economic and Monetary Union (EMU) countries and suggested that cash holdings were positively affected by the investment opportunity set besides their dependence on other factors. Ozkan and Ozkan (2004) found evidence that firms' growth opportunities were important in determining cash holdings. The factors influencing the cash holdings of real estate investment trusts (REIT) were examined by Hardin et al. (2009). The cash holdings were found to be directly related to the cost of external finance and growth opportunities. Duchin (2010) studied the relation between corporate liquidity and diversification. The key finding was that multi-division firms held significantly less cash than stand-alone firms because they were diversified in their investment opportunities. Gill and Mathur (2011) uncovered the factors that influence corporate liquidity holdings in Canada. A co-relational and non-experimental research design was employed to show that, among other factors, corporate liquidity holding was influenced by investment opportunities. Kim, Kim and Woods (2011) examined the determinants of cash holding levels for restaurant firms in USA. A panel data examination provided evidence that firms with greater investment opportunities tend to hold more cash.

Size of the firm was found to be another notable determinant for corporate cash holdings. Drobetz and Grüninger (2007) explored the determinants of a broad sample of Swiss non-financial firms' cash holdings. The results indicated that firm size was negatively related to cash holdings. D'Mello, Krishnaswami and Larkin (2008) studied the factors that influenced the cash allocation decision around a spin-off, using variables suggested by the trade-off theory and controlling for the possible endogeneity of leverage and cash ratios. The results indicated that managers allocated higher cash ratios to smaller firms. In addition to growth opportunities, some other studies including Ferreira and Vilela (2004), Gill and Mathur (2011) and Kim et al. (2011) also found that corporate cash holdings were significantly influenced by size of the firm.

A reasonable number of research works identified the quality of cash flows as a determinant for corporate cash holdings. In addition to the seminal work of Opler et al. (1999), as referred to above, Ozkan and Ozkan (2004) also found evidence that firms' cash flows were important in determining cash holdings. Drobetz and Grüninger (2007) explored the determinants of a broad sample of Swiss non-financial firms' cash holdings. The results indicated that the operating cash flows were positively related to cash reserves. Building on the motives, Han and Qiu (2007) modelled the precautionary motive for a firm's cash holdings. A two-period investment model showed that the cash holdings of financially constrained firms were sensitive to cash flow volatility because financial constraints created an inter-temporal trade-off between current and future investments. Bates, Kahle and Stulz (2009) found that the average cash-to-assets ratio for US industrial firms increased largely because their cash flows got riskier.

Interest in the uncertainties prevailing at the macroeconomic level has always been well known in economic literature. Their impact on corporate cash holdings could not have been an exception. Investigating whether changes in macroeconomic volatility affected the efficient allocation of non-financial firms' liquid assets, Baum et al. (2006) found that higher uncertainty hampered managers' ability to accurately predict firm-specific information and induced them to implement similar cash management policies. This was followed by another effort wherein using a panel of non-financial US firms, Baum et al. (2008) examined the link between the optimal level of liquid assets and uncertainty. A partial equilibrium model of precautionary demand for liquid assets was developed showing that firms altered their liquidity ratio in response to changes in either macroeconomic or idiosyncratic uncertainty. Chen and Mahajan (2010) investigated the effects of macroeconomic conditions on corporate liquidity. Controlling for conventional firm-specific variables and building in the endogeneity problem, it was

shown that select macroeconomic variables affected corporate cash holdings. Expectations of future economic conditions also affected cash holdings. Bhaduri and Kanti (2011) analyzed the effect of firm-level and macroeconomic uncertainty on the decisions of Indian firms with regard to their optimal cash holdings. Using a dynamic panel data model, the study found strong support for the hypothesis that Indian firms increased their cash holdings with an increase in either form of uncertainty.

Another factor that has been cited in the extant research as a determinant of corporate cash holdings is leverage employed by the firm. In their aforesaid work on the EMU countries, Ferreira and Vilela (2004) investigated the determinants of corporate cash holdings and suggested that cash held by corporates was negatively affected by leverage. D'Mello et al. (2008) also found that managers allocated higher cash ratios to firms with low leverage. Results of the study conducted by Drobetz and Grüninger (2007) indicated that there was a non-linear relationship between the leverage ratio and liquidity holdings.

Availability of bank loan to the firm also came to be acknowledged as a determinant of cash held by the firms. Dittmar, Mahrt-Smith and Servaes (2003) found that corporations in countries where shareholders' rights were not well protected held up to twice as much cash as corporations in countries with good shareholder protection. In consistence with the importance of agency costs, it was found that firms held larger cash balances when access to funds was easier. Ferreira and Vilela (2004) also contributed to this factor and suggested that bank debt and cash holdings were negatively related, which showed that a close relationship with banks allowed the firm to hold less cash for precautionary reasons. In their examination of the factors influencing the cash holdings of REITs, Hardin et al. (2009) also found that cash holdings were negatively associated with credit line access and use.

Yet another factor that influenced the corporate cash holdings is working capital level as a whole or the level of its remaining constituents, such as inventory or receivables. Using variables suggested by the trade-off theory, D'Mello et al. (2008) indicated that firms with low net working capital ratio maintained higher cash ratios. Bates et al. (2009) found that the average cash-to-assets ratio increased because the sample firms held fewer inventories and receivables. Researching on the factors impacting cash held by the firms, Gill and Mathur (2011) showed that corporate liquidity holding was influenced by its net working capital. Firms holding liquid assets other than cash tended to hold less cash according to the study conducted by Kim et al. (2011).

Research and development intensiveness and dividend payouts have also determined the corporate cash holdings. Results of D'Mello et al. (2008) indicated that higher cash ratios were allocated by managers of the firms with high research and development expense ratio. The average cash-to-assets ratio was also found to increase by Bates et al. (2009) for sample firms that had higher expenditure on research and development. Just as for the operating cash flows, Drobetz and Grüninger (2007) found that dividend payments were positively related to cash reserves. Kim et al. (2011) also showed that firms paying dividends held less cash. Al-Najjar (2013) investigated the effect of capital structure and dividend policy on cash holdings in Brazil, Russia, India and China and compared results with a control sample from the US and the UK. The results showed some evidence that dividend policy affected cash holdings. There were similarities between developed and developing countries on the factors determining corporate cash holdings.

Besides the ones mentioned above, there have been studies suggesting other miscellaneous influencing factors for corporate cash holdings. Agency problems were found to be the determinants of cash held by the corporates by Opler et al. (1999). Riddick and Whited (2009) showed that inter-temporal trade-offs between interest income taxation and the cost of external finance determine optimal savings. Controlling for Tobin's  $q$ , saving and cash flow were found to be negatively related because firms lowered cash reserves to invest after receiving positive cash-flow shocks, and vice versa. Kusnadi and Wei (2011) documented that firms in countries with strong legal protection of minority investors were more likely to

decrease their cash holdings in response to an increase in cash flow than the firms in countries with weak legal protection. This relationship was most pronounced for firms that were financially constrained and those with high hedging needs. Recognizing that industry and capital market conditions may impede a firm's desire to achieve its targeted cash holding levels, Venkiteshwaran (2011) estimated a dynamic model that allowed firms to adjust their cash holding levels over time and found evidence consistent with a trade-off-type behaviour in cash holding levels. Using a partial adjustment model, it was found that firms rapidly correct any deviation from their targeted cash levels. Iskandar-Datta and Jia (2012) documented a pronounced secular upward trend in cash holdings which was almost systemic across seven industrialized countries, with France exhibiting a modest rise and Japan a substantial decline.

While the above review demonstrates several studies that have been done to explain the determinants of corporate cash holdings, it can be noted that as stated earlier not much work has been done in the Indian context. And even among these, none have used static panel data methodology based on the model put forth by Bates et al. (2009) to study the financial determinants of corporate cash holdings. This research gap became the prime motivator for building up this article.

## Data and Methodology

The sample of study consists of National Stock Exchange (NSE) S&P CNX 500 companies for a period of 2007–2012, excluding financial and banking firms, investment and holdings companies, utilities and firms with missing data. The final sample includes 395 firms covering 2,370 firm years' balanced panel data. The data were sourced from the Capitaline and Centre for Monitoring Indian Economy (CMIE) Prowess databases. The NSE S&P CNX 500 index reflects about 95.87 per cent of the free-float market capitalization of the stocks listed on NSE as on 28 March 2013.

This study builds on the model suggested by Bates et al. (2009) and uses panel data regression analysis for estimation of model. The panel data analysis has certain advantages, such as higher variability, lower collinearity among explanatory variables, greater degree of freedom and higher efficiency (Baltagi, 2008). The general form of a panel data model can be written as:

$$Y_{it} = \alpha + \beta X_{it} + \mu_{it}$$

where the subscript  $i$  denotes the cross-sectional dimension and  $t$  represents the time series dimension,  $Y_{it}$  represents the dependent variable (cash/TA),  $X_{it}$  is the set of explanatory variables in the estimation model,  $\alpha$  is the constant,  $\beta$  represents the coefficients and  $\mu_{it}$  is a random term. It is known that  $\mu_{it} = u_i + v_{it}$  where  $u_i$  is the firm-specific effect and  $v_{it}$  is the random term.

Due to inadequacy of pooled ordinary least square (OLS) regression method based on  $F$ -test statistics as well as the Breusch and Pagan Lagrangian multiplier (LM) test (1980), we applied panel data regression for the estimation of model. The Hausman (1978) test has been used to determine whether to employ fixed- or random-effect method for panel data regression. This test results suggested the use of fixed-effects model over random effects. Hence, we estimated the following model based on Bates et al. (2009) by employing fixed-effects method of regression.

$$\begin{aligned} \text{Cash}_{it}/\text{TA}_{it} = & \beta_0 + \beta_1 \text{Size}_{it} + \beta_2 \text{NWC}_{it}/\text{TA}_{it} + \beta_3 \text{CF}_{it}/\text{TA}_{it} + \beta_4 \text{MBR}_{it} + \\ & \beta_5 \text{CE}_{it}/\text{TA}_{it} + \beta_6 \text{R\&D}_{it}/\text{S}_{it} + \beta_7 \text{LEV}_{it} + \beta_8 \text{DIV}_{it} + \beta_9 \text{NDI}_{it} + \beta_{10} \text{NEI}_{it} + \\ & \beta_{11} \text{RISK}_{it} + \beta_{12} \text{TBY}_{it} + \beta_{13} \text{DFS}_{it} \end{aligned}$$

where

|         |  |
|---------|--|
| Cash/TA | = Cash-to-total assets ratio measured as cash and bank balance plus marketable securities, divided by book value of total assets.                            |
| Size    | = Natural logarithm of book value of assets in 2012 rupee value.   |
| NWC/TA  | = Ratio of working capital minus cash and marketable securities to total assets.   |
| CF/TA   | = Cash flow over total assets, where cash flow is measured as operating income before depreciation, less interest and taxes, excluding other income.         |
| MBR     | = Market-to-book ratio, it is measured as the sum total assets minus book value of equity plus market value of equity divided by book value of total assets. |
| CE/TA   | = Ratio of capital expenditure to total assets.  |
| R&D/S   | = Ratio of research and development expenses to sales.   |
| LEV     | = Leverage is the ratio of total debt to total assets.   |
| DIV     | = Dividend dummy variable equal to one if the firm paid a common dividend in that year and zero, if it did not pay any dividend.                             |
| NDI     | = Net debt issuance equal to long-term debt issuance minus long-term debt repayment scaled by book value of total assets.                                    |
| NEI     | = Net equity issuance equal to equity issuance minus equity buyback scaled by book value of total assets.  |
| RISK    | = Rolling standard deviation of cash flow of a firm taken 3 years at a time.   |
| TBY     | = Average annual yield on 91-day T-bill issued by the RBI.   |
| DFS     | = Default spread is the difference between 'BBB' and 'AAA' rated corporate bond yields.  |

## Results and Discussion

The descriptive statistics and the correlation matrix of the variables employed for the estimated model are presented in Tables 1 and 2. The results as laid down in Table 1 reveal that the minimum and maximum cash-to-total assets ratio for the sampled firms is 0 and 0.84, respectively. The average cash-to-total assets ratio for the sampled firms is 14.4 per cent with a standard deviation of 15.5 per cent, which is above the mean levels of cash ratio (8–10.5 per cent) found for US listed firms (Kim et al., 1998; Opler et al., 1999). The median cash holding of Indian listed firms equals to 9 per cent of total assets and is almost equal to median values found in EMU listed firms (9.1 per cent) as reported by Ferreira and Vilela (2004), but reasonably higher than those for the UK listed firms (5.9 per cent) as reported by Ozkan and Ozkan (2004).

The size and market-to-book ratio of sampled firms exhibit high standard deviation in comparison with other variables under investigation. The mean value of leverage for our sampled firms is 0.42 with a standard deviation of 0.21, which indicates that listed Indian firms on an average depend more on equity financing than debt. The average of market-to-book ratio is 2.16, revealing that the market is placing a premium on the value of these firms over the acquisition value of their assets. The net working capital to total assets of the sampled firm has a mean value of 0.03 with a standard deviation of 0.21. The values of skewness and kurtosis for the variables under investigation, as seen in Table 1, clearly indicate asymmetry in the distribution of sampled firms. The frequency distributions of underlying variables are not normal. This is substantiated by the fact that all the variables have the significant coefficient of Jarque–Bera statistics.

**Table 1.** Descriptive Statistics

|              | CASH/TA | CE/TA  | CF/TA  | DFS   | DIV   | LEV   | MBR     | NDI    |
|--------------|---------|--------|--------|-------|-------|-------|---------|--------|
| Mean         | 0.14    | 0.08   | 0.11   | 0.03  | 0.86  | 0.42  | 2.13    | 0.02   |
| Median       | 0.09    | 0.05   | 0.10   | 0.03  | 1.00  | 0.43  | 1.52    | 0.00   |
| Maximum      | 0.83    | 0.98   | 1.21   | 0.03  | 1.00  | 1.36  | 29.34   | 0.51   |
| Minimum      | 0.00    | 0.00   | -0.67  | 0.02  | 0.00  | 0.00  | 0.05    | -0.36  |
| Std. Dev.    | 0.16    | 0.09   | 0.09   | 0.00  | 0.35  | 0.21  | 1.95    | 0.07   |
| Skewness     | 1.63    | 3.00   | 1.42   | -0.64 | -2.10 | 0.03  | 4.97    | 2.52   |
| Kurtosis     | 5.59    | 18.24  | 20.10  | 2.56  | 5.41  | 2.29  | 48.17   | 16.06  |
| Jarque-Bera  | 1,714   | 26,475 | 29,659 | 179   | 2,314 | 50    | 211,193 | 19,344 |
| Probability  | 0       | 0      | 0      | 0     | 0     | 0     | 0       | 0      |
| Sum          | 340.6   | 184.2  | 256.8  | 59.2  | 2043  | 997.7 | 5035.7  | 41.4   |
| Sum Sq. Dev. | 56.6    | 18.7   | 17.4   | 0     | 281.9 | 103.2 | 9018.1  | 10.1   |
| Observations | 2370    | 2370   | 2370   | 2370  | 2370  | 2370  | 2370    | 2370   |

|              | NEI    | NWC/TA | R&D/S      | RISK       | SIZE     | TBY   |
|--------------|--------|--------|------------|------------|----------|-------|
| Mean         | 0.03   | 0.03   | 0.01       | 0.07       | 7.69     | 0.07  |
| Median       | 0.00   | 0.04   | 0.00       | 0.02       | 7.64     | 0.07  |
| Maximum      | 0.96   | 0.71   | 1.56       | 14.71      | 12.60    | 0.08  |
| Minimum      | -0.35  | -0.96  | 0.00       | 0.00       | 0.21     | 0.03  |
| Std. Dev.    | 0.10   | 0.21   | 0.05       | 0.41       | 1.35     | 0.02  |
| Skewness     | 4.41   | -0.60  | 24.28      | 24.55      | 0.35     | -0.83 |
| Kurtosis     | 27.09  | 4.97   | 664.81     | 768.46     | 3.86     | 2.61  |
| Jarque-Bera  | 64,984 | 527    | 43,484,604 | 58,098,765 | 122      | 286   |
| Probability  | 0      | 0      | 0          | 0          | 0        | 0     |
| Sum          | 65.7   | 78.8   | 16         | 153.8      | 18,234.3 | 156.4 |
| Sum Sq. Dev. | 21.6   | 100.2  | 6          | 396.2      | 4301.9   | 0.7   |
| Observations | 2370   | 2370   | 2370       | 2370       | 2370     | 2370  |

**Source:** Prepared by the authors.

**Table 2.** Pearson Correlation Matrix

|         | Cash/TA | SIZE    | LEV     | NWC/TA  | MBR     | RD/S    | CF/TA   |
|---------|---------|---------|---------|---------|---------|---------|---------|
| Cash/TA | 1       |         |         |         |         |         |         |
| SIZE    | -0.03   | 1       |         |         |         |         |         |
| LEV     | -0.42** | 0.19**  | 1       |         |         |         |         |
| NWC/TA  | -0.55** | -0.09** | 0.14**  | 1       |         |         |         |
| MBR     | 0.19**  | -0.15** | -0.24** | -0.18** | 1       |         |         |
| RD/S    | -0.03   | -0.07** | 0.01    | -0.07** | 0.33**  | 1       |         |
| CF/TA   | 0.33**  | -0.17** | -0.48** | -0.07** | 0.29**  | -0.11** | 1       |
| DIV     | 0.13**  | 0.04*   | -0.16** | 0.05**  | -0.01   | -0.09** | 0.33**  |
| CE/TA   | -0.13** | -0.05*  | 0.11**  | -0.08** | -0.03   | 0.01    | 0.08**  |
| NEI     | 0.14**  | -0.09** | -0.09** | -0.12** | 0.08**  | -0.02   | -0.13** |
| NDI     | -0.06** | 0.04    | 0.25**  | 0.02    | -0.08** | -0.01   | -0.13** |
| TBY     | -0.01   | 0.08**  | -0.02   | 0.02    | 0.12**  | -0.01   | 0.01    |
| DFS     | -0.03   | 0.10**  | -0.019  | 0.01    | -0.12** | 0.02    | -0.07** |
| RISK    | 0.01    | -0.08** | 0.01    | -0.00   | 0.00    | -0.00   | -0.02   |

(Table 2 continued)

(Table 2 continued)

|         | DIV     | CE/TA   | NEI     | NDI   | TBY     | DFS     | RISK |
|---------|---------|---------|---------|-------|---------|---------|------|
| Cash/TA |         |         |         |       |         |         |      |
| SIZE    |         |         |         |       |         |         |      |
| LEV     |         |         |         |       |         |         |      |
| NWC/TA  |         |         |         |       |         |         |      |
| MBR     |         |         |         |       |         |         |      |
| RD/S    |         |         |         |       |         |         |      |
| CF/TA   |         |         |         |       |         |         |      |
| DIV     | I       |         |         |       |         |         |      |
| CE/TA   | 0.00    | I       |         |       |         |         |      |
| NEI     | -0.13** | 0.01    | I       |       |         |         |      |
| NDI     | -0.08** | 0.24**  | -0.02   | I     |         |         |      |
| TBY     | 0.02    | -0.08** | 0.00    | -0.03 | I       |         |      |
| DFS     | -0.01   | -0.03   | -0.10** | -0.02 | -0.37** | I       |      |
| RISK    | -0.05** | 0.02    | 0.09**  | 0.01  | 0.01    | -0.16** | I    |

**Source:** Prepared by the authors.

**Note:** \* and \*\* significance at 5% and 1% level (2-tailed), respectively.

Based on correlation matrix results from Table 2, this study finds that the correlation between any given pair of independent variables does not exceed 0.8. Hence, multicollinearity does not seem to be a concern. In addition, the variance inflation factor for the tolerance has also been verified. There is a significant negative correlation between cash-to-total assets ratio and net working capital, leverage, capital expenditure and net debt issued by the firm. On the other hand, there is a significant positive correlation between market-to-book ratio, dividends, cash flow and cash holdings of the sampled firms. However, insignificant negative correlation has been found between the research and development expenditure, T-bill yield, default spread and cash holdings of the firm.

The results of fixed-effects regression model for identifying financial determinants of corporate cash holdings are presented in Table 3. Based on these results, it is observed that the estimated model is statistically significant at 1 per cent level in explaining the determinants of cash holdings of sampled firms with  $F$ -value of 33.25 ( $p < 0$ ). The adjusted  $R$ -square value of 0.8462 indicates that about 84.62 per cent of the variation in the cash holding levels of sampled firms has been explained by the 13 explanatory variables. The  $t$ -statistics related with the variables CE/TA, DIV, LEV, CF/TA, NDI and NEI indicate that they are statistically significant at 1 per cent level, and MBR and RD/S are statistically significant at 5 per cent level. The negative coefficients of variables, such as CE/TA, LEV, NWC/TA and RD/S, reveal that cash holding levels of sampled firms have a significant negative relationship with the net working capital, leverage, research and development expenditure as well as capital expenditure of the firm.

The results also show a significant negative relationship between leverage and cash holdings of sampled firms. This is in line with and supported by the earlier studies (Bates et al., 2009; Ferreira & Vilela, 2004; Kim et al., 1998; Opler et al., 1999). As discussed earlier, leverage can be regarded as a substitute for holding a larger amount of cash and marketable securities. In addition, it can be observed that a one-unit increase in the leverage of the sampled firm will cause a 0.15-unit decrease in the ratio of cash to total assets of the firms. Based on the negative coefficient of net working capital, it can be inferred that a one-unit increase in the ratio of networking capital to total assets of the firm causes a 0.39-unit decrease in the ratio of cash to total assets of the sampled firms. It also implies that firms with



**Table 3.** Fixed-effects Regression Results

| Variable              | Coefficient | Std Error                | t-statistic | Prob.    |
|-----------------------|-------------|--------------------------|-------------|----------|
| CE/TA                 | -0.063      | 0.019                    | -3.292      | 0.001*** |
| CF/TA                 | 0.123       | 0.028                    | 4.346       | 0.000*** |
| DFS                   | -0.360      | 0.369                    | -0.976      | 0.329    |
| DIV                   | 0.018       | 0.007                    | 2.580       | 0.009*** |
| LEV                   | -0.145      | 0.016                    | -8.840      | 0.000*** |
| MBR                   | 0.003       | 0.001                    | 2.194       | 0.028**  |
| NDI                   | 0.173       | 0.024                    | 7.284       | 0.000*** |
| NEI                   | 0.168       | 0.016                    | 10.193      | 0.000*** |
| NWC/TA                | -0.385      | 0.015                    | -26.186     | 0.000*** |
| R&D/S                 | -0.110      | 0.040                    | -2.773      | 0.005*** |
| RISK                  | 0.003       | 0.003                    | 0.818       | 0.414    |
| SIZE                  | -0.004      | 0.004                    | -1.161      | 0.246    |
| TBY                   | -0.119      | 0.091                    | -1.301      | 0.193    |
| C                     | 0.232       | 0.029                    | 7.895       | 0.000*** |
| R-squared             | 0.873       | Mean dependent variation |             | 0.144    |
| Adjusted R-squared    | 0.846       | SD dependent variation   |             | 0.155    |
| SE of regression      | 0.061       | Akaike info. criterion   |             | -2.608   |
| Sum squared residuals | 7.247       | Schwarz criterion        |             | -1.614   |
| Log likelihood        | 3498.000    | Hannan–Quinn criterion   |             | -2.246   |
| F-statistic           | 33.037      | Durbin–Watson statistic  |             | 1.501    |
| Prob (F-statistic)    | 0.000       |                          |             |          |

**Source:** Prepared by the authors.

**Note:** \*\* and \*\*\* significance at 5% and 1% level, respectively.

more liquid assets can exchange those assets into cash and in turn hold lower levels of cash, as their liquidity needs are supported by the net working capital (Bates et al., 2009; Dittmar et al., 2003; Opler et al., 1999; Ozkan & Ozkan, 2004). This implies that firms with financial flexibility to access external funds are less in need of cash to finance their investment projects. The negative impact of capital expenditure on cash holding suggests that the firms with greater capital expenditures hold less cash, as capital expenditure may increase the earning capacity and enhance the debt capacity thereby reducing the need for holding cash. This finding is consistent with the results of Bates et al. (2009).

The significant positive coefficients for variables CF/TA, DIV, MBR, NDI and NEI indicate that cash holdings of sampled firms are positively affected by the cash flow, dividend payments, market-to-book ratio, net debt issuance and net equity issuance. A strong positive relationship is found to exist between investment opportunities represented by market-to-book ratio and cash holding which supports the expected positive sign from trade-off and pecking order theories and contradicts the expected negative sign of free cash flow theory. Accordingly, a one-unit increase in market-to-book ratio of the firm will increase 0.003 units in the cash holdings. This implies that firms with more investment opportunities tend to hold more cash in order to finance their growing investment opportunities and insulate against any possible liquidity shortages. This result is supported by the earlier studies documented in the literature (Bates et al., 2009; Ferreira & Vilela, 2004; Hardin et al., 2009; Kim et al., 1998; Opler et al., 1999; Ozkan & Ozkan, 2004). The positive relationship between investment opportunities and cash holdings is also well supported by the precautionary motive of holding cash. Firms with greater

investment opportunities hold more cash because of adverse macroeconomic shocks and financial distress, which are more costly to firms with more investment opportunities than to those with fewer investment opportunities (Bates et al., 2009).

The significant positive coefficient of dividend dummy variable depicts that dividend has a positive influence on corporate cash holdings. Dividend paying companies need to hold the cash reserves to honour the commitment made for the payment of dividends to investors. This empirical result is consistent with the proposition presented by Ozkan and Ozkan (2004). Conversely, Bates et al. (2009) found a significant negative relationship between cash holdings and dividend payments. In accordance with pecking order theory, a significant positive relationship is observed between the ratio of cash flow to total assets and cash holdings. A one-unit increase in the cash flow of the firm will cause a 0.12-unit increase in the cash holdings. Possibly a profitable firm is able to accumulate the cash holdings more than a less profitable firm. Results also show a significant positive relationship between the ratios of net equity issuance to total assets and net debt issuance to total assets with the cash holdings. This could imply that the firms that issued equity or raised debt in recent times held more cash than other firms. A one-unit increase in net equity issuance and net debt issuance causes a 0.16-unit and 0.17-unit increase in the cash holdings of the firms. As reported in Table 3, there is an insignificant negative relationship between size of the firm and T-bill yield and an insignificant positive relationship between risk, corporate bond default spread rate and cash holdings, as represented by their respective *t*-statistics.

## Conclusion

This study examined the financial determinants of corporate cash holdings by using panel data regression for the estimation of model based on Bates et al. (2009) and by employing fixed-effects regression method. Based on its empirical results, the study concludes that there is a significant negative relationship between cash holding and the net working capital ratio, leverage, research and development expenditure as well as capital expenditure ratio of the sampled firms. Firms with higher debt ratios or leverage are found to have lower cash holdings. This empirical result supports the findings of Kim et al. (1998), Opler et al. (1999), Ferreira and Vilela (2004) and Bates et al. (2009). A significant positive relationship exists between investment opportunities and cash holdings of sampled firms, which is in line with and supporting the earlier studies documented in literature (Bates et al., 2009; Ferreira & Vilela, 2004; Hardin et al., 2009; Kim et al., 1998; Opler et al., 1999; Ozkan & Ozkan, 2004). In addition, this study also finds a significant positive relationship between cash holdings and net equity and debt issuance of firms.

Corporate cash holdings have been found to have material consequences on the financial and operating performance of a firm as was observed by Mikkelsen and Partch (2003), rendering cash to be an important dimension of the financial policies of a firm. The implications of this study would be beneficial for the business managers to have a better understanding and appreciation of the role and importance of the determinants of corporate cash holdings in formulating and evaluating the corporate financial policies. Effective liquidity management of a firm is critical to the successful attainment of long-term financial goals and objectives of the firm. Moreover, this study will help the investors and analysts to assess the marginal value of cash and to consequently arrive at the enterprise value, as the majority of the listed firms hold cash on their balance sheets.

Further research can be extended by considering the cross listing of firms, business group affiliations or firm structure, corporate spin-offs, corporate governance variables and investor protection levels of the Indian listed firms.

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