Determinants of Corporate Cash Holdings: Evidence from India

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ABSTRACT

We examine the evolution and determinants of corporate cash holdings of Indian non-financial firms for the period 2001-2016. In contrast to a prominent increase in corporate liquidity levels globally after the global financial crisis, we document a gradual decline in corporate cash holdings of Indian non-financial firms. We provide empirical evidence to show that profitability, operating cash flow and cash flow volatility are positively associated with cash holdings. Further, our results suggest that size, leverage, liquidity, capital expenditure and promoter ownership share a negative relationship with cash holdings. In addition, we do not find concrete empirical evidence regarding relationship of corporate cash holdings with growth potential and dividend payments. Our results are broadly consistent across five panel data estimation techniques namely pooled ordinary least squares regression, Fama-MacBeth procedure, fixed effects estimator, between effects estimator and system generalised method of moments estimator. Moreover, we use an alternative proxy of corporate cash holdings to reinforce the robustness of our findings. Finally, our results show that a typical Indian non-financial firm achieves target cash levels in a time span of 2.18 years on an average, thereby highlighting a slower speed of adjustment of corporate cash holdings as compared to firms in developed economies.

Keywords: Corporate Cash Holdings, Firm-Specific Characteristics, Speed of Adjustment, India, Emerging Market

JEL Classification Codes: G30, G32

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1. INTRODUCTION

Prudent management of corporate cash holdings[1] represents one of the most vital areas of concern with regard to fundamental financial decisions of a firm: financing, investing and paying out profits. In order to finance investments and expand the scale of operations, a firm carefully decides the amount of cash to be raised since there is a cost associated with both forms of external capital - debt and equity. Further, selection of appropriate projects which meet the hurdle rate is constrained by the level of liquid assets possessed by the firm. Finally, payments to shareholders in the form of dividend or buyback are determined by the management based on the amount of liquid assets held by the firm. As an integral part of corporate assets, cash and cash equivalents serve as a two-edged sword. Dittmar, Mahrt-Smith & Servaes (2003) argue that under the assumption of shareholder wealth maximisation, holding cash bears the 'cost of carry'. Further, a shortage of liquid assets may lead to loss of potential investment opportunities, disruption in production and financial distress. Hence, abundance as well as paucity of liquid assets may turn out to be an impediment in pursuit of shareholder wealth maximisation.

Corporate finance textbooks suggest that each firm has its own appropriate cash level and firms ought to keep just enough cash to meet their debt obligations, operational expenses, capital expenditures, investment opportunities, contingencies etc. In general, corporate balance sheets across the world have witnessed a prominent growth in cash holdings over the past two decades (Bates, Kahle & Stulz, 2009; Graham, Leary & Roberts, 2015; Paulo, 2018). The '2018 Global Finance Cash 25' rankings reveal that the cut-off to prepare the list of world's top 25 corporate cash hoarders was registered at $24.4 billion, representing a massive growth of 50% over 2017's threshold of $16.3 billion[2]. In comparison to a marked increase in

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[1] Throughout this paper, we use the terms 'cash holdings', 'liquid assets', 'cash balance' and 'corporate liquidity' interchangeably. This practice is widely common considering that corporate cash holdings have been measured in the form of 'cash and cash equivalents' in most empirical studies as some highly liquid assets like marketable securities are almost identical to cash in terms of liquidity.

[2] The 'Global Finance Cash 25' ranks publicly listed non-financial firms by cash, cash equivalents and short-term securities (those maturing between three months and a year) on their balance sheets. See https://www.gfmag.com/magazine/september-2018/global-finance-cash-25-2018 for details.

corporate cash holdings across the world over the past two decades, firms in India have remained stable (Samaan & Schott, 2016). In concurrence with surging corporate cash holdings across the world, a vast and diverse body of literature has emerged over the past two decades concerning distinct aspects of corporate liquidity (see da Cruz, Kimura & Sobreiro, 2019 for a detailed review). However, emerging markets (except China) have received limited attention from researchers on the issue of corporate cash holdings as compared to developed economies (Amess, Banerji & Lampousis, 2015; Akhtar, Tareq, Sakti & Khan, 2018). In relation to liquid asset holdings of Indian listed firms, few empirical papers have analysed determinants of cash holdings and identified a variety of firm-specific and macroeconomic factors which influence corporate liquidity (Bhat & Bachhawat, 2005; Bhaduri & Kanti, 2011; Anand, Varaiya & Thenmozhi, 2012; Maheshwari & Rao, 2017; Roy, 2018; Anand, Thenmozhi, Varaiya & Bhadhuri, 2018; Chauhan, Pathak & Kumar, 2018; Rao & Thaker, 2018; Ranajee & Pathak, 2019).

Keeping in view the importance of maintaining an optimal level of cash holdings in the interest of shareholder wealth maximisation, this study serves two pertinent objectives. First, we study the evolution of average level of cash holdings of Indian non-financial firms from financial year (FY) 2000-01 to FY 2015-16. Second, we examine the relationship of cash holdings of Indian non-financial firms with a range of firm-level characteristics. Our findings show that firm size, leverage, liquidity, capital expenditure and promoter ownership share a negative and significant relationship with cash holdings whereas profitability, operating cash flow and cash flow volatility are associated with high levels of cash holdings. In order to examine the robustness of these results, we use a total of five different estimation techniques namely pooled ordinary least squares (OLS) regression, Fama-MacBeth procedure, fixed effects estimator (based on firm and industry fixed effects), between effects estimator and dynamic panel regression (in particular, system generalised method of moments estimator). To our knowledge, this is the first study to investigate firm-specific determinants of corporate cash holdings across five methodologies concurrently. In addition, we find that a typical Indian non-

financial firm achieves target cash levels in a time span of 2.18 years (or approximately 26 months) on an average[3]. Our study contributes to existent literature in multiple ways. First, we present empirical evidence on firm-specific determinants of corporate cash holdings in an emerging market setup. Amess, Banerji & Lampousis (2015) and Akhtar, Tareq, Sakti & Khan (2018) highlight lack of literature regarding corporate cash management in the context of emerging economies. Further, to the best of our knowledge, our sample dataset covers a longer time frame in relation to empirical studies on determinants of cash holdings of Indian firms (Bhat & Bachhawat, 2005; Bhaduri & Kanti, 2011; Anand, Varaiya & Thenmozhi, 2012; Maheshwari & Rao, 2017; Roy, 2018; Anand, Thenmozhi, Varaiya & Bhadhuri, 2018; Chauhan, Pathak & Kumar, 2018; Rao & Thaker, 2018; Ranajee & Pathak, 2019). Second, we examine determinants of corporate cash holdings against the backdrop of a striking downtrend in cash balances of Indian non-financial firms after the global financial crisis of 2008-09. In fact, we highlight that cash holdings of our sample firms have consistently decreased each year since FY 2009-10 till FY 2015-16 (except a marginal rise in FY 2014-15). Since corporate cash holdings have increased across the world in general (Graham, Leary & Roberts, 2015; Paulo, 2018), our findings may serve as a reference in order to identify reasons for the distinctive evolution of corporate cash levels in India. Third, we highlight that empirical results with regard to determinants of corporate cash holdings are sensitive to estimation methodologies as well as proxies of cash holdings. Fourth, we contribute to the limited literature on speed of adjustment of corporate cash holdings by showing that firms in emerging markets like India may not attain their target cash levels as fast as their counterparts in developed economies potentially due to higher adjustment costs.

The remainder of the paper is structured as follows. Section 2 discusses existent related literature and develops hypotheses. Section 4 explains the data and methodologies used in the study. Section 5 highlights results of the empirical analysis. Section 6 provides a summary of the findings.

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[3] In this regard, we are aware of only two related papers (Anand, Thenmozhi, Varaiya & Bhadhuri, 2018; Rao & Thaker, 2018) which examine speed of adjustment of cash holdings for listed firms in India.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The extant literature provides three significant theories to explain the rationale behind corporate cash decisions: trade-off theory (Baumol, 1952 and Miller & Orr, 1966), financing hierarchy theory (Myers, 1984; Myers & Majluf, 1984) and free cash flow theory (Jensen, 1986). With the arguments of these theories as a guiding force, a significant strand of papers on cash holdings has identified a diverse array of determinants of corporate liquidity ranging from firm-specific characteristics and economic conditions to rule of law and cultural factors (Kim, Mauer & Sherman, 1998; Ozkan & Ozkan, 2004; Ferreira & Vilela, 2004; Ramírez & Tadesse, 2009; Duchin, 2010; Chen, Dou, Rhee, Truong & Veeraraghavan, 2015). Further, studies across varied geographical markets and time frames have identified a list of certain common firm-specific factors which drive corporate cash policy (see Iskandar-Datta & Jia, 2012 for an elaborate discussion).

A vast segment of prior studies links firm-specific characteristics and firm-specific risk to transaction and precautionary demand for cash (Opler, Pinkowitz, Stulz & Williamson, 1999; Almeida, Campello & Weisbach, 2004; Bates, Kahle & Stulz, 2009; Al-Najjar, 2013) whereas only a few papers explore the speculative motive of holding cash (Yu, Lee & Fok, 2015). Further, a limited number of studies have examined the impact of macroeconomic factors and macroeconomic risk on corporate cash holdings (Anand, Thenmozhi, Varaiya & Bhadhuri, 2018; Baum, Caglayan, Ozkan & Talavera, 2006; Baum, Caglayan, Stephan & Talavera, 2008; Chen & Mahajan, 2010; Natke, 2001). In addition, recent papers have put forth innovative and interesting factors to explain variation in cash holdings like knowledge intensity (Lin, 2014), peer group effect (Joo, Yang & Yang, 2016), CEO's gender (Zeng & Wang, 2015), taxation aspects (Di & Hanke, 2013; Hanlon, Maydew & Saavedra, 2017), business group membership (Locorotondo, Dewaelheyns & Van Hulle, 2014) etc.

Based on the rationale and arguments of theories on corporate cash management, empirical research suggests several firm-specific variables as determinants of corporate cash holdings of Indian firms. As one of the earliest studies on this topic, Bhat & Bacchawat (2005) examine data

pertaining to 117 listed manufacturing firms in India and report that number of block-holders, ownership by other firms, leverage and asset tangibility are negatively related with cash holdings. Anand, Varaiya & Thenmozhi (2012) analyse 1,700 non-financial firms listed on National Stock Exchange (NSE) for the period 2001-2011 to show that higher ownership by promoters and institutions is associated with higher cash holdings. Further, the study also finds that private ownership, government ownership and foreign ownership are positively related with corporate cash holdings. For a sample of 58 listed Indian firms studied for the period 2008-2013, Roy (2018) documents that firms with stronger corporate governance practices hold less cash. In order to examine financial determinants of cash holdings, Maheshwari & Rao (2017) employ a sample of 395 Indian firms which form part of National Stock Exchange (NSE) S&P CNX 500 and conclude that cash holdings share a positive relationship with cash flow, dividend payment, market-to-book ratio, net debt issuance and net equity issuance. Further, the study also reports a negative influence of net working capital, leverage, research and development expenditure as well as capital expenditure on cash holdings. More recently, Chauhan, Pathak & Kumar (2018) examine more than 2,000 Indian non-financial firms to report that firms with a bank-appointed director hold lesser cash than firms without bank-appointed directors. The study also indicates that this relationship is driven by bankers' ability to alleviate the financial constraints of the firm by improving access to bank and non-banking financial institution loans.

Several papers have also ascertained macroeconomic determinants of corporate cash holdings in the context of Indian firms. Using a sample of 240 firms spread across 33 industries for the period 1996-2005, Bhaduri & Kanti (2011) find that cash holdings increase with a rise in idiosyncratic as well as macroeconomic uncertainty. On similar lines, Ranajee & Pathak (2019) document significantly higher cash levels in Indian firms during financial crisis. Further, they report consistency in firm-specific determinants of cash holdings during periods of financial crisis, stability and recovery. They also find that cash holdings are lower for group-affiliated firms as compared to standalone firms and promoter ownership affects cash holdings positively. In addition, Anand, Thenmozhi, Varaiya & Bhadhuri (2018) employ dynamic panel estimation (system generalised method of moments) to study a sample of 805 Indian non-financial firms

and suggest that macroeconomic factors including real gross domestic product (GDP) growth rate, changes in exchange rate, changes in crude oil prices, changes in stock market index and credit spread affect cash holdings positively whereas inflation is negatively related with corporate liquidity. Finally, Rao & Thaker (2018) analyse the dynamic nature of corporate cash holdings for a sample of 849 Indian non-financial firms over the period 2007-2012 and find the speed of adjustment of cash holdings to be 0.406 which implies that firms close the gap between actual and target cash holdings within 2.5 years on an average.

Firm-specific determinants of corporate cash holdings

In line with prior literature (Al-Najjar, 2013; Locorotondo, Dewaelheyns &Van Hulle, 2014; Loncan, 2018; Anand, Varaiya & Thenmozhi, 2012; Anand, Thenmozhi, Varaiya & Bhadhuri, 2018), we focus on the relationship between corporate cash holdings and a range of firm-specific characteristics for a sample of Indian non-financial firms. Next, we discuss theoretical arguments with respect to the relationship between cash holdings and its determinants considered in this study.

Firm size (-): There are multiple reasons for a negative relationship between firm size and cash holdings. First, Miller & Orr (1966) suggest economies of scale in cash management. Second, smaller firms are expected to hold higher cash balances due to greater sensitivity to economic shocks, greater information asymmetry and higher costs of financial distress than large firms. Third, large firms are expected to hold relatively less liquid assets than small firms due to better access to external capital markets. Hence, we expect a negative relationship between firm size and cash holdings.

Leverage (+/-): Since higher debt levels signify a greater ability to raise capital, Ferreira & Vilela (2004) argue that firms with higher leverage would hold less cash. Similarly, Baskin (1987) also suggests a negative relationship between cash holdings and leverage as the opportunity cost of investing in liquid assets increases with debt financing. In contrast, Acharya, Almeida & Campello (2007) contend that cash holdings and leverage move in the same direction to the extent that firms' borrowing capability serves as a substitute for cash holdings. Moreover, firms with higher leverage may be expected to hold higher cash to reduce the probability of experiencing financial distress (Ozkan & Ozkan, 2004).

Hence, relationship between cash holdings and leverage is ambiguous.

Liquidity (-): Liquid assets (other than cash and cash equivalents) serve as substitutes of cash in an event of liquidity crunch. Consequently, firms with more liquid assets are expected to hold less cash.

Profitability (+/-): According to pecking order theory, cash holdings are an outcome of a firm's financing and investing activities (Dittmar, Mahrt-Smith & Servaes, 2003). Thus, controlling for these activities, more profitable firms are expected to stockpile more cash and vice-versa. Hence, profitability and cash holdings may be positively related. However, profits provide an immediate source of liquidity. If cash and profits are substitutes, there should be a negative relationship between the two (Kim, Mauer & Sherman, 1998). Likewise, Al-Najjar (2013) finds a negative relationship between cash holdings and profitability in a cross-country analysis. Thus, the direction of impact of profitability on cash holdings is unclear.

Growth opportunities (+): Firms with better investment opportunities are expected to hold larger cash balances due to a higher opportunity cost of cash shortage in the form of lost profitable opportunities. In addition, while information asymmetry makes external funding costlier for such firms, cash holdings serve as a financial cushion which reduces financial distress costs. To this extent, we expect growth opportunities and cash holdings to be positively related.

Cash flow (+/-): The financing hierarchy theory suggests that there is no optimal level of cash holdings and firms' cash balances are simply a consequence of investment and financing decisions (Myers & Majluf, 1984). Thus, cash flows are expected to be positively related to cash holdings. However, Kim, Mauer & Sherman (1998) argue that free cash flows provide a ready source of liquidity to meet operating expenditures and hence, firms with higher cash flows are less likely to be financially constrained. Therefore, they postulate an inverse relationship between cash flows and cash holdings. Taken together, the direction of relationship between cash flows and cash holdings is not clear.

Dividend payments (+/-): Firms which pay dividend can afford to hold lesser cash as they can cope better with a cash shortfall by cutting down dividend payments (Al-Najjar, 2013; Opler, Pinkowitz, Stulz &

Williamson, 1999). However, a dividend-paying firm may maintain higher cash holdings simply to avoid a situation in which they are not able to pay dividend (Ozkan & Ozkan, 2004). Hence, there is lack of clarity on the exact relationship between cash holdings and dividend payments.

Capital expenditure (+/-): According to Riddick & Whited (2009), productivity shocks that lead to jumps in investments can lead to lower cash balances. Moreover, capital expenditure creates assets that can be employed as collateral for borrowing purposes, leading to a reduced demand for cash by firms. Contrarily, a positive relationship between cash holdings and capital expenditure may well be justified due to information asymmetries associated with raising funds for long-term investment purposes, thereby leading to higher opportunity costs in the form of costlier external financing. Thus, the relationship between capital expenditure and cash holdings is inconclusive.

Cash flow volatility (+): More volatile cash flows signify a higher probability of cash shortages due to unexpected decline in cash flows. Thus, firms with higher operating cash flow volatility are expected to hold more cash.

Promoter ownership (-): Shareholders' objectives are pursued when managers invest in profitable projects and distribute any excess cash to shareholders after all profitable investments have been made (Opler, Pinkowitz, Stulz & Williamson, 1999). Thus, we expect promoters to leverage their control for distribution or investment of excess cash. Hence, we propose an inverse relationship between promoter ownership and cash holdings.

3. DATA AND METHODOLOGY

We build our sample from Prowess database maintained by Centre for Monitoring Indian Economy (CMIE) Pvt. Ltd. for the period 2001-2016. To begin with, we consider Indian firms listed on Bombay Stock Exchange (BSE). We exclude financial firms, government firms and firms operating in the co-operative sector due to their idiosyncratic requirements for holding liquid assets. In order to alleviate the effects of extreme observations, we trim top and bottom 1% observations of all relevant

continuous variables[4]. Further, we screen the dataset to remove erroneous observations across variables[5]. Thus, our unbalanced panel dataset is narrowed down to 1696 Indian non-financial firms. However, due to missing firm-year observations, the effective number of firms is lower for regressions considered in the study. Table 1 provides details with regard to definition, measurement and abbreviation of all variables used in the study.

Table 1: List of variables with their respective definitions and abbreviations

Variable	Description	Abbreviation
Cash holdings (Dependent variable)	(Cash and cash equivalents)/Total assets or (Cash and cash equivalents)/(Total assets - Cash and cash equivalents)	Cash/TA or Cash/NA
Size	Natural logarithm of total assets (measured in INR millions)	Size
Leverage	Total borrowings/Total assets	Leverage
Liquidity	(Current assets-current liabilities-cash and cash equivalents)/Total assets	Liquidity
Profitability	Return on total assets	Profitability
Growth potential	(Market value of firm)/Book value of firm	Growth potential
Cash flow	(Net operating cash flow)/Total assets	Cash flow
Dividend payment	Dummy variable (1 if dividend paid in the year and 0 otherwise)	Dividend
Capital expenditure	(Cash outflow due to purchase of fixed assets)/Total assets	Capex
Cash flow volatility	Standard deviation of (Net cash flow/Total assets) over past 5 years	CF volatility
Promoter	Equity ownership of promoters (in %)	Promoter

The table provides the list of variables along with details on their definitions and abbreviations used in the study. All items mentioned in the description of variables have been taken directly from Prowess database maintained by Centre for Monitoring Indian Economy (CMIE) Pvt. Ltd. except return on total assets, market value of firm and book value of firm. Return on total assets has been calculated as 'Earnings before interest and taxes divided by total assets'. Further, market value of firm has been calculated as (Total outstanding stock*stock price observed on June 30 of the succeeding financial year + total borrowing). Although values of all variables have been considered at the end of financial year (i.e. March 31), we use stock prices as on June 30 instead of March 31 in order to adjust for the time taken by firms to release financial statements in the public domain. Book value of the firm is represented by book value of total assets.

[4] We do not trim data pertaining to dividend payments since issues associated with extreme observations are not relevant for categorical variables.

[5] Specifically, we remove observations which are either less than 0 or greater than 1 for variables like cash holdings, leverage and all variables pertaining to equity ownership. We consider observations greater than 0 for firm size and growth potential. Further, we only consider observations greater than or equal to 0 for capital expenditure and cash flow volatility.

3.1. Descriptive Statistics

We report descriptive statistics for pooled data of relevant variables in Table 2[7]. The mean and standard deviation of cash holdings for a typical non-financial Indian firm are reported as 4% and 5.7% respectively. Firms in our sample dataset have almost 30% borrowed capital on their balance sheets. Indicating the diversity of our sample, size of firms varies between INR 21.3 million and INR 1,30,229 million. The average liquidity level and return on total assets of firms are documented as 12.5% and 7.1% respectively. Measured as the ratio of market value of firm to book value of firm, growth potential of a typical Indian non-financial firm is documented as 0.81. As a testimony to concentrated ownership pattern in Indian firms, promoter ownership is found to be substantially high with mean and median of 50.7% and 51.1% respectively. Further, the mean values of operating cash flow and capital expenditure scaled by total assets are reported as 6.3% and 5.3% respectively.

[7] We do not report descriptive statistics for dividend payment since it is a dummy variable.

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Table 2: Descriptive statistics of variables used in the study

Variables	Mean	Minimum	25th Percentile	Median	75th Percentile	Maximum	Std. Dev.	Skewness	Kurtosis	Count
Cash/TA	0.040	0.000	0.008	0.019	0.045	0.388	0.057	2.897	12.759	25896
Size	5061.870	21.300	250.600	879.600	3388.200	130229.037	12871.140	4.937	32.483	26429
Leverage	0.297	0.000	0.121	0.289	0.441	0.999	0.211	0.443	2.674	26243
Liquidity	0.125	-0.558	0.000	0.118	0.259	0.648	0.191	-0.114	3.339	25823
Profitability	0.071	-0.259	0.031	0.068	0.110	0.366	0.077	-0.033	5.061	24238
Growth potential	0.811	0.080	0.447	0.638	0.914	5.354	0.663	2.977	14.633	23517
Cash flow	0.063	-0.310	0.004	0.059	0.117	0.617	0.104	0.423	5.592	26025
Capex	0.053	0.000	0.010	0.031	0.073	0.351	0.061	1.919	6.938	24128
CF volatility	0.034	0.000	0.008	0.018	0.042	0.311	0.044	2.767	12.526	25899
Promoter	0.507	0.073	0.394	0.511	0.632	0.898	0.167	-0.177	2.493	25481

Notes: This table provides descriptive statistics of variables used in the study. Details regarding abbreviation and measurement of variables are presented in Table 1. Although firm size has been measured as natural logarithm of total assets in the study, we report descriptive statistics for firm size in the form of total assets (measured in INR millions) since interpretation of descriptive statistics for natural logarithm of total assets is not very intuitive.

3.2. Methodology

We adopt a battery of estimation techniques to examine the robustness of the relationship between corporate cash holdings and its determinants. In line with existent empirical literature, we use a total of five methodologies to ascertain determinants of corporate cash holdings namely pooled OLS regression (Hardin, Highfield, Hill & Kelly, 2008; Attaullah Shah, 2011; Joo, Yang & Yang, 2016), Fama-MacBeth (Fama & MacBeth, 1973) regression (Opler, Pinkowitz, Stulz & Williamson, 1999; Ferreira & Vilela, 2004; Jebran, Chen & Tauni, 2019), fixed effects estimator (Gao, Harford & Li, 2013; He, 2018; Devos & Rahman, 2018; Huang-Meier, Lambertides & Steeley, 2015; Cleary & Wang, 2017; Hu, Li & Zeng, 2019), between effects estimator and dynamic panel regression (Kuan, Li & Chu, 2011; Álvarez, Sagner & Valdivia, 2012, Rao & Thaker, 2018; Shin, Kim, Shin & Lee, 2018; Anand, Thenmozhi, Varaiya & Bhadhuri, 2018). To begin with, we employ pooled OLS estimation which disregards the panel structure of our dataset. Considering all firm-year observations as homogenous entries corresponding to the same population, pooled OLS regression does not differentiate between firms and ignores the time dimension in the dataset. Due to presence of heteroscedasticity[8] and serial correlation[9], we report standard errors clustered at firm level for regressions corresponding to pooled OLS.

Next, we use Fama-MacBeth regression which provides the average of the time series of coefficients from annual cross-sectional regressions. In the first step, the coefficients of independent variables are obtained from cross-sectional regressions estimated every year. In the second step, the final coefficient for each variable is obtained by averaging respective yearly coefficients obtained in the first step. The final standard error of each variable is measured as the standard error of the distribution of yearly coefficients obtained in the first step. Similarly, the final R-squared of the regression is also represented by the average of yearly values of R-squared obtained in the first step.

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[8] We use Modified Wald test for examining group-wise heteroskedasticity (Greene, 2000). We reject the null hypothesis of homoskedasticity at 1% level of significance.

[9] We use Wooldridge test of autocorrelation for panel data (Wooldridge, 2010) to check for serial correlation. The null hypothesis of absence of serial correlation is rejected at 1% level of significance.

In order to address omitted variable bias and incorporate heterogeneity across cross-sectional units as well as time, we employ fixed-effects model (we estimate separate models with firm-fixed effects and industry fixed effects) to investigate the determinants of cash holdings. The Hausman test ratifies our choice of model specification as the null hypothesis of zero correlation between explanatory variables and error term gets rejected[10]. In order to control the impact of macroeconomic factors, we include time dummies in fixed effects regressions. Further, we report standard errors clustered at firm level for fixed effects regressions. In addition, we also estimate between-effects regression in order to identify determinants of corporate cash holdings on the basis of cross-sectional heterogeneity in our sample dataset. As part of between effects regression, variation in variables across time is removed by taking an average of all variables across time. Next, the final results of between effects model are obtained by estimating a cross-sectional regression using the average values of variables. In this way, the between effects estimator only utilizes cross-sectional heterogeneity in order to derive coefficients and standard errors of independent variables.

Finally, we employ system generalised method of moments (GMM) estimator developed by Arellano & Bover (1995) and Blundell & Bond (1998) in order to address the dynamic adjustment behaviour of corporate cash holdings. We follow Venkiteshwaran (2011) to examine mean-reverting properties of cash holdings. In this regard, we estimate a first order autoregressive model of changes in cash holdings (i.e. Cash/TA and Cash/NA) with firm fixed effects and time dummies[11]. The model is shown below.

$$D(\text{Cash/TA})_{it} = a + bD(\text{Cash/TA})_{it-1} + e_{i,t} \quad (1)$$

where, a is intercept term. i is firm identifier and t is time identifier. b is regression coefficient of lag of first-differenced cash holdings. $e_{i,t}$ represents the conventional error term which is assumed to be independently and identically distributed with zero mean.

Further, we consider standard errors clustered at firm level. The estimated

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[10] We report results of Hausman test along with our main findings in Table 5.

[11] In consonance with Guariglia & Yang (2016), we also run pooled OLS regression to investigate dynamic adjustment behaviour of corporate cash holdings. We find statistically significant evidence to validate mean-reverting properties of cash holdings. Results are available upon request.

values of b are found to be -0.336 (significant at 1% level of significance) and -0.551 (significant at 1% level of significance) for models with Cash/TA and Cash/NA as proxies of cash holdings respectively[12]. Clearly, this negative and significant coefficient indicates that cash holdings display mean-reverting properties.

The system GMM estimator builds a system of two equations – the original equation with level values of the variables (for which the lagged first-differenced values of variables serve as instruments) and the transformed equation with first-differenced variables (for which the lagged level values of variables serve as instruments). In order to deal with consequences of endogeneity (in the form of biased and inconsistent estimates) due to simultaneous relationships between cash holdings and its determinants, we consider five regressors namely leverage, liquidity, dividend payments, capital expenditure and growth potential as endogenous in all regression models[13]. The validity of estimates obtained from system GMM estimator depends on multiple diagnostic tests. In this regard, we use the Sargan–Hansen J test for over-identified restrictions in order to evaluate the validity of instruments (Sargan 1958; Hansen 1982) and Arellano-Bond test of second-order serial correlation to verify the absence of second-order serial correlation in the first-differenced residuals[14]. Further, we employ the two-step variant of system GMM estimator since it is asymptotically more efficient than the one-step variant and provides standard errors robust to heteroscedasticity (Windmeijer, 2005). In order to minimise the loss of information due to missing observations on account of an unbalanced panel dataset, we use forward orthogonal deviations for obtaining transformed equation in all our models[15] (Roodman, 2009). Furthermore, we vary the lag

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[12] For the sake of brevity, we do not report detailed results of these fixed effects regressions. However, the same are available upon request.

[13] In addition, consistent with the standard practice in dynamic panel modelling, we also treat lagged value of dependent variable (i.e. lagged value of cash holdings) as an endogenous variable in system GMM models.

[14] For all system GMM regressions reported in this study, we fail to reject the null hypotheses of instrument validity and absence of second-order serial correlation in first-differenced residuals. Hence, system GMM regressions in our study satisfy both these diagnostic tests.

[15] For IV (instrumental variable) style treatment of exogenous regressors, we use the option 'model (level)' in system GMM models.

length of GMM style instruments of endogenous variables between one and fourteen periods for system GMM regressions reported in this study.

In line with existent literature (Al-Najjar, 2013; Locorotondo, Dewaelheyns & Van Hulle, 2014; Loncan, 2018; Anand, Varaiya & Thenmozhi, 2012; Anand, Thenmozhi, Varaiya & Bhadhuri, 2018), we use the following base model specification for all regressions estimated in this study.

$$(Cash/TA)_{i,t} = a + b_1 Size_{i,t} + b_2 Leverage_{i,t} + b_3 Liquidity_{i,t} + b_4 Profitability_{i,t} + b_5 Growth\ potential_{i,t} + b_6 Cash\ flow_{i,t} + b_7 Dividend_{i,t} + b_8 Capex_{i,t} + b_9 CF\ Volatility_{i,t} + b_{10} Promoter_{i,t} + e_{i,t} \quad (2)$$

where, a is intercept term. i is firm identifier and t is time identifier. b_k are regression coefficients corresponding to regressors. $e_{i,t}$ represents the conventional error term.

For system GMM regressions, we use the following model in order to capture the auto-regressive nature of corporate cash holdings.

$$(Cash/TA)_{i,t} = d(Cash/TA)_{i,t-1} + b_1 Size_{i,t} + b_2 Leverage_{i,t} + b_3 Liquidity_{i,t} + b_4 Profitability_{i,t} + b_5 Growth\ potential_{i,t} + b_6 Cash\ flow_{i,t} + b_7 Dividend_{i,t} + b_8 Capex_{i,t} + b_9 CF\ Volatility_{i,t} + b_{10} Promoter_{i,t} + e_{i,t} \quad (3)$$

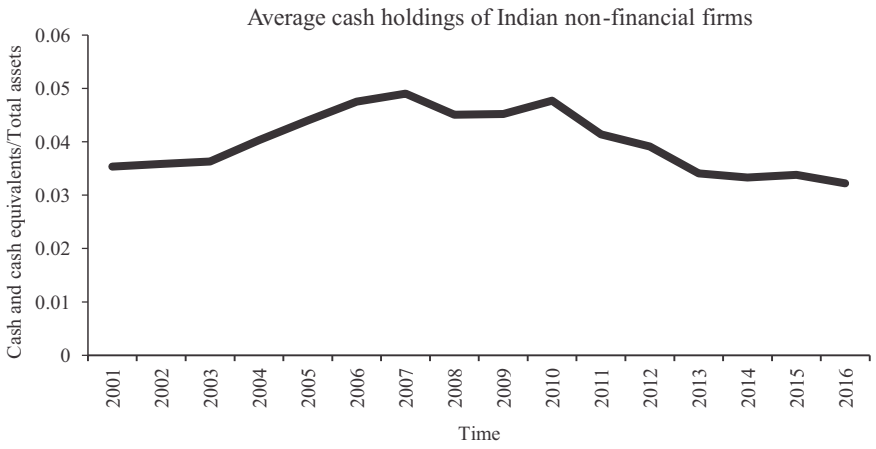
Finally, we control the effect of cross-section invariant variables (such as macroeconomic factors) by including time dummies in system GMM regressions.

4. RESULTS

Despite a pronounced upward trend in corporate cash holdings globally, Indian non-financial firms witnessed a gradual drop in average level of liquid assets over the past decade. In Figure 1, we show yearly trend of mean corporate cash holdings (defined as the ratio of cash and cash equivalents to total assets) for our sample of 1696 Indian non-financial firms over the period 2001-2016. In order to obtain data points for construction of this graph, we average the available values of cash holdings of firms for each year. As is evident in the figure, average cash holdings vary in a narrow range between 3.22% and 4.90%. From 2001 to 2007, cash balances steadily rise to reach a peak of 4.90% in 2007. Due to the global financial

crisis of 2008-09, liquid asset holdings experienced a conspicuous decline as firms utilized cash to fund operational and financial obligations amidst contraction in income and consumption levels accompanied by a significant liquidity crunch in external capital markets. Since 2010, cash holdings have consistently decreased each year (except 2015) to touch a low of 3.22% in 2016. This stark contrast in the evolution of cash holdings of Indian non-financial firms vis-à-vis their international counterparts presents an interesting opportunity to understand the peculiarity of cash management practices of Indian firms.

Figure 1: Trend of yearly average of corporate cash holdings of Indian non-financial firms



The figure shows the trend of ratio of cash and cash equivalents to book value of total assets for a sample of 1696 Indian non-financial firms for the period 2001-2016. Each data point of this figure represents average of firm-specific ratios of cash and cash equivalents to book value of total assets for a particular year. Data have been taken from Prowess database maintained by Centre for Monitoring Indian Economy (CMIE) Pvt. Ltd.

The downtrend in liquidity levels of Indian non-financial firms is corroborated by the yearly descriptive statistics of cash holdings presented in Table 3. In addition to average cash holdings, the values of first quartile, median and third quartile have also declined over the years to reach their lowest levels measured at 0.4%, 1.2% and 3.4% respectively in financial year (FY) 2015-16.

Table 3: Evolution of cash holdings of Indian non-financial firms

Year	Mean	Minimum	25th Percentile	Median	75th Percentile	Maximum	Count
2001	0.035	0.000	0.008	0.018	0.038	0.382	1530
2002	0.036	0.000	0.008	0.019	0.039	0.388	1574
2003	0.036	0.000	0.008	0.019	0.040	0.381	1592
2004	0.040	0.000	0.009	0.021	0.045	0.367	1602
2005	0.044	0.000	0.010	0.023	0.049	0.383	1596
2006	0.048	0.000	0.010	0.025	0.055	0.388	1607
2007	0.049	0.000	0.011	0.026	0.058	0.382	1636
2008	0.045	0.000	0.010	0.024	0.055	0.378	1638
2009	0.045	0.000	0.010	0.023	0.053	0.373	1638
2010	0.047	0.000	0.010	0.024	0.056	0.386	1640
2011	0.041	0.000	0.008	0.020	0.047	0.386	1649
2012	0.039	0.000	0.007	0.018	0.045	0.385	1654
2013	0.035	0.000	0.006	0.016	0.039	0.386	1637
2014	0.034	0.000	0.005	0.014	0.035	0.384	1656
2015	0.033	0.000	0.005	0.013	0.036	0.376	1654
2016	0.032	0.000	0.004	0.012	0.034	0.385	1593

This table provides yearly descriptive statistics of corporate cash holdings for firms included in the sample of this study. Corporate cash holdings have been measured as (Cash and cash equivalents)/Total assets.

In Table 4, we present descriptive statistics of corporate cash holdings across 61 broad industries which constitute our sample of 1696 Indian non-financial firms. The categorisation of firms across industries is based on first two digits of National Industrial Classification (NIC) code issued by Central Statistical Organisation, Ministry of Statistics and Programme Implementation[16]. Clearly, the level of cash holdings varies considerably across industries. On an average, firms in agriculture, forestry and fishing sector (represented by industry code 00) hold a lower proportion of their assets in liquid assets (i.e. 1%) as compared to other industries. On the contrary, firms involved in the business of travel, tour and other reservation facilities (represented by industry code 79) exhibit highest level of cash holdings (i.e. 16%) in our dataset.

[16] For details on industry classification of firms as per National Industrial Classification (NIC) code, please refer https://udyogaadhaar.gov.in/UA/Document/nic_2008_17apr09.pdf

Table 4: Industry-wise descriptive statistics of corporate cash holdings

NIC Code (First 2 digits)	Mean	Minimum	25th Percentile	Median	75th Percentile	Maximum	Count
00	0.010	0.000	0.002	0.005	0.016	0.045	41
10	0.036	0.000	0.007	0.016	0.039	0.363	1288
11	0.040	0.000	0.009	0.021	0.050	0.381	448
12	0.022	0.000	0.007	0.014	0.028	0.172	93
13	0.024	0.000	0.005	0.012	0.026	0.344	2158
14	0.061	0.001	0.014	0.029	0.076	0.376	280
15	0.023	0.002	0.009	0.016	0.030	0.093	138
16	0.025	0.001	0.006	0.017	0.034	0.152	110
17	0.026	0.001	0.008	0.017	0.030	0.242	430
19	0.050	0.001	0.013	0.035	0.081	0.270	139
20	0.037	0.000	0.008	0.019	0.042	0.382	2593
21	0.046	0.000	0.008	0.020	0.053	0.383	1407
22	0.028	0.000	0.009	0.018	0.033	0.357	1338
23	0.037	0.000	0.008	0.019	0.043	0.318	869
24	0.032	0.000	0.008	0.018	0.036	0.359	1548
25	0.040	0.000	0.009	0.022	0.041	0.371	460
26	0.046	0.000	0.010	0.023	0.054	0.382	459
27	0.052	0.000	0.012	0.029	0.061	0.383	886
28	0.052	0.000	0.013	0.030	0.067	0.377	1089
29	0.030	0.000	0.007	0.017	0.036	0.382	815
30	0.056	0.001	0.007	0.021	0.048	0.385	147
32	0.040	0.000	0.008	0.022	0.048	0.368	342
34	0.032	0.000	0.008	0.019	0.037	0.295	644
35	0.054	0.001	0.010	0.034	0.084	0.386	76
41	0.041	0.000	0.007	0.018	0.046	0.370	896
42	0.049	0.000	0.010	0.024	0.058	0.386	501
43	0.036	0.000	0.007	0.018	0.038	0.388	78
45	0.037	0.008	0.014	0.030	0.054	0.113	15
46	0.046	0.000	0.007	0.021	0.055	0.382	3072
47	0.033	0.002	0.013	0.020	0.032	0.327	59
49	0.050	0.002	0.023	0.037	0.069	0.198	55
50	0.054	0.002	0.010	0.020	0.069	0.297	64
52	0.036	0.000	0.007	0.021	0.044	0.235	171
53	0.080	0.053	0.065	0.073	0.091	0.139	16
55	0.036	0.000	0.007	0.017	0.038	0.337	539
56	0.022	0.006	0.014	0.022	0.028	0.043	16
58	0.087	0.000	0.018	0.059	0.114	0.321	64
59	0.048	0.000	0.003	0.010	0.052	0.335	228
60	0.080	0.001	0.009	0.037	0.154	0.362	59
61	0.082	0.000	0.008	0.024	0.136	0.386	112
62	0.067	0.000	0.011	0.034	0.087	0.386	841
63	0.039	0.001	0.007	0.022	0.046	0.218	59

64	0.039	0.002	0.008	0.017	0.058	0.261	31
70	0.024	0.000	0.007	0.022	0.029	0.130	46
71	0.047	0.000	0.016	0.030	0.054	0.300	74
72	0.064	0.001	0.014	0.036	0.078	0.312	16
73	0.042	0.002	0.007	0.013	0.039	0.275	39
74	0.052	0.000	0.001	0.008	0.019	0.349	15
77	0.042	0.000	0.005	0.020	0.049	0.388	347
79	0.160	0.008	0.107	0.176	0.202	0.332	32
8	0.051	0.003	0.017	0.026	0.097	0.162	32
81	0.029	0.002	0.008	0.018	0.036	0.248	169
82	0.079	0.001	0.019	0.053	0.118	0.318	32
85	0.033	0.000	0.002	0.009	0.036	0.211	60
86	0.039	0.000	0.005	0.018	0.053	0.236	235
89	0.043	0.009	0.017	0.028	0.057	0.141	31
90	0.029	0.002	0.007	0.038	0.043	0.061	16
93	0.059	0.001	0.007	0.039	0.083	0.284	30
94	0.055	0.003	0.006	0.012	0.019	0.382	16
95	0.016	0.006	0.011	0.017	0.021	0.028	16
96	0.062	0.012	0.026	0.036	0.113	0.157	16

The table provides yearly descriptive statistics of corporate cash holdings for industries included in the sample dataset of this study. Corporate cash holdings have been measured as (Cash and cash equivalents)/Total assets. For details of industries corresponding to NIC codes, please refer https://udyogaadhaar.gov.in/UA/Document/nic_2008_17apr09.pdf.

In Table 5, we present empirical evidence corresponding to the relationship between corporate cash holdings and firm-specific characteristics. In particular, we report results of 12 regressions across five different estimation techniques in order to examine the consistency of association between cash holdings and ten firm-specific factors. For robustness purposes, we consider two proxies of corporate cash holdings which are widely used in empirical literature - cash and cash equivalents divided by total assets (Ozkan & Ozkan, 2004; Kusnadi & Wei, 2011; Nguyen & Rahman, 2018) and cash and cash equivalents divided by total assets net of cash and cash equivalents (Ferreira & Vilela, 2004; Wu, Rui & Wu, 2012; Xu & Li, 2018). To begin with, we notice a negative and statistically significant relationship between cash holdings and firm size (measured as natural logarithm of total assets) across all methodologies except regressions with firm fixed effects. Compared to small firms, large firms have better access to funds from external capital markets due to their long-standing relationships with financial institutions and a broader base of assets available for collateralized borrowings. In contrast, small firms face higher chances of financial distress due to higher information asymmetries

(Fazzari & Petersen, 1993; Berger, Klapper & Udell, 2001). Hence, cash holdings of large Indian non-financial firms seem to be lower than their small counterparts. In line with majority of existent empirical literature (Kalcheva & Lins, 2007; Álvarez, Sagner & Valdivia, 2012; Fernandes & Gonenc, 2016; Chen, Li & Wee, 2018), our findings reveal a negative relationship between leverage and cash holdings. Since high debt financing is associated with a high opportunity cost of investment in liquid assets, a highly leveraged firm in our sample seems to maintain a lower level of cash holdings.

Further, we report negative and significant impact of liquidity (i.e. liquid assets other than cash and cash equivalents) on cash holdings for our sample firms. This finding is consistent with previous studies (Megginson, Ullah & Wei, 2014; Baldi & Bodmer, 2017; Devos & Rahman, 2018) as net non-cash working capital acts as a substitute of cash and cash equivalents. In addition, we document definite evidence to show that profitability and cash holdings of Indian non-financial firms are positively related. Since firms with higher profits are likely to generate higher cash earnings, cash holdings of such firms are apparently higher keeping other factors constant. In this regard, our findings are consonant with Hall, Mateus & Mateus (2014), Joo, Yang & Yang (2016) and Vo (2018) but contradictory to Cleary & Wang (2017). In relation to the impact of growth potential on cash holdings, we do not find sufficient empirical evidence as the regression coefficient of growth potential is not statistically significant in regressions based on pooled OLS, Fama-MacBeth procedure, industry fixed effects and system GMM. Further, regressions corresponding to firm fixed effects show a positive and significant relationship between growth opportunities and cash holdings. However, for Cash/TA as the proxy of cash holdings, between effects estimator indicates a negative and significant influence of growth potential on cash holdings. Thus, our results seem to indicate absence of a statistically significant relationship between cash holdings and growth opportunities for Indian non-financial firms. In fact, this incongruence in findings clearly underscores the sensitivity of results to operational proxies of cash holdings and estimation techniques adopted in empirical studies.

With the exception of estimations based on between effects estimator, regressions across all methodologies suggest a positive association of cash holdings with operating cash flow. This suggests that Indian non-financial

firms with higher cash flow from operating activities tend to accumulate more liquid assets on their balance sheets. In this respect, our results support findings of previous studies including Baldi & Bodmer (2017), Devos & Rahman (2018), Loncan (2018), Nguyen & Rahman (2018). In relation to linkages between dividend payment and cash holdings, we document relatively inconclusive evidence since the regression coefficient of dividend payment turns out to be positive and significant only for Fama-MacBeth regressions and fixed effects estimator (with only Cash/TA as the proxy of cash holdings). Hence, our findings indicate that cash holdings of Indian non-financial firms do not seem to be determined by dividend payments.

Regarding the relationship between capital expenditure and cash holdings, our results across all regressions (except system GMM regression with Cash/NA as proxy of cash holdings) show a negative and significant coefficient for capital expenditure. This indicates that Indian non-financial firms with higher capital expenditure seem to hold lower cash balances as capital expenditure creates assets that can be employed as collateral for borrowing purposes, leading to a reduced demand for cash by firms. Similarly, we find statistically significant evidence across all methodologies (except firm fixed effects estimator) to support a positive relationship of cash flow volatility with cash holdings. Since higher variability in cash flows represents higher probability of a cash crunch, Indian non-financial firms with greater cash flow volatility seem to hold more liquid assets. Finally, our findings show a negative and significant association between promoter ownership and cash holdings across all regressions (except between effects regression with Cash/NA as proxy of cash holdings). Thus, higher promoter ownership in Indian non-financial firms seems to entail lower accumulation of excess liquid assets on balance sheets because of enhanced supervision and control exercised by promoters on firm's management. In this regard, promoters with considerable shareholding in Indian non-financial firms seem to directly participate in the decision making process or guide the actions of managers in an advisory capacity to ensure that any excess cash is distributed to shareholders if firms have no value-enhancing investments to pursue.

In order to examine the speed of adjustment of cash holdings for a typical Indian non-financial firm, we consider the system GMM regression which employs Cash/TA as the proxy of cash holdings (please refer model 11). The

positive and significant coefficient of lagged cash holdings i.e. 0.5406 indicates the level of persistence in cash holdings of firms in our sample. Subtracting this coefficient from 1, we get 0.4594 which represents the magnitude of adjustment made by firms on an average to reach target levels of cash holdings. Further, the speed of adjustment of cash holdings is obtained as 1/0.4594 i.e. 2.18 years. Hence, our results suggest that Indian non-financial firms seem to fully correct deviations from target cash levels in a time span of 2.18 years (or approximately 26 months) on an average. This result is consistent with Rao & Thaker (2018) who document the average time taken to reach the target level of cash holdings to be slightly less than two and a half years for listed manufacturing firms in India. Notably, firms in our sample seem to reach their target levels of cash holdings at a slightly lower pace than firms in developed markets such as the U.S. (Venkiteshwaran, 2011). As documented by Chang, Deng & Wang (2015) and Guariglia & Yang (2016) in the context of listed firms in China, this slower speed of adjustment toward target cash levels is an indication of potentially higher adjustment costs faced by firms in emerging markets vis-à-vis their counterparts on developed economies.

Our findings should be viewed in light of the limitations of the study. Firstly, we consider a specific range of firm-specific characteristics as independent variables in our model and omit other potential determinants of cash holdings such as research and development expenditure. This omission of independent variables may lead to biased and inconsistent coefficients, thereby rendering our results regarding relationship between cash holdings and firm-level characteristics as potentially erroneous. Second, our results may not be generalised to financial firms, government firms and firms operating in the co-operative sector since these categories of firms have been excluded from our analysis. Third, we do not consider additional proxies of firm-specific characteristics to examine robustness of our findings. For instance, we only use return in total assets as a measure of profitability, thereby ignoring other indicators of profitability such as return on equity and return on capital employed.

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Table 5: Determinants of cash holdings of Indian non-financial firms

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Pooled OLS		Fama-MacBeth		Firm Fixed Effects		Industry Fixed Effects		Between Effects		System GMM	
	Dependent variable: Cash holdings											
Variables:	Cash/TA	Cash/NA	Cash/TA	Cash/NA	Cash/TA	Cash/NA	Cash/TA	Cash/NA	Cash/TA	Cash/NA	Cash/TA	Cash/NA
Size	-0.0035***	-0.0045***	-0.0029***	-0.0037***	0.0012	0.0013	-0.0041***	-0.0053***	-0.0032***	-0.0042***	-0.0016*	-0.0021
	(0.0009)	(0.0012)	(0.0008)	(0.0011)	(0.0025)	(0.0032)	(0.0010)	(0.0013)	(0.0010)	(0.0014)	(0.0009)	(0.0014)
Leverage	-0.0354***	-0.0435***	-0.0350***	-0.0424***	-0.0241***	-0.0290**	-0.0300***	-0.0370***	-0.0361***	-0.0453***	0.0215	0.0162
	(0.0063)	(0.0083)	(0.0054)	(0.0072)	(0.0091)	(0.0121)	(0.0064)	(0.0084)	(0.0107)	(0.0146)	(0.0201)	(0.0277)
Liquidity	-0.0298***	-0.0417***	-0.0484***	-0.0650***	-0.0705***	-0.0944***	-0.0528***	-0.0702***	-0.0329**	-0.0441**	-0.0271**	-0.0364**
	(0.0073)	(0.0100)	(0.0059)	(0.0075)	(0.0098)	(0.0136)	(0.0089)	(0.0125)	(0.0128)	(0.0176)	(0.0128)	(0.0172)
Profitability	0.1106***	0.1374***	0.1013***	0.1278***	0.0962***	0.1219***	0.1088***	0.1358***	0.1246***	0.1415**	0.1141***	0.1227**
	(0.0163)	(0.0216)	(0.0134)	(0.0174)	(0.0149)	(0.0202)	(0.0160)	(0.0214)	(0.0413)	(0.0565)	(0.0357)	(0.0544)
Growth potential	-0.0013	-0.0010	0.0005	0.0014	0.0035**	0.0050**	-0.0004	0.0000	-0.0068**	-0.0084*	-0.0085	-0.0093
	(0.0016)	(0.0022)	(0.0021)	(0.0027)	(0.0017)	(0.0024)	(0.0016)	(0.0022)	(0.0032)	(0.0044)	(0.0056)	(0.0093)
Cash flow	0.0201**	0.0281**	0.0182*	0.0260**	0.0335***	0.0445***	0.0253**	0.0350**	-0.0331	-0.0320	0.0687***	0.0874***
	(0.0102)	(0.0139)	(0.0088)	(0.0113)	(0.0099)	(0.0138)	(0.0102)	(0.0139)	(0.0360)	(0.0492)	(0.0150)	(0.0203)
Dividend	0.0056	0.0066	0.0283**	0.0396***	0.0086*	0.0112	0.0037	0.0049	-0.0115	-0.0153	-0.0413	-0.0495
	(0.0050)	(0.0067)	(0.0107)	(0.0132)	(0.0050)	(0.0072)	(0.0049)	(0.0067)	(0.0178)	(0.0243)	(0.0341)	(0.0573)
Capex	-0.0382***	-0.0548***	-0.0661***	-0.0906***	-0.0305***	-0.0444***	-0.0623***	-0.0839***	-0.0973**	-0.1351**	-0.1141***	-0.1191**
	(0.0134)	(0.0174)	(0.0123)	(0.0151)	(0.0117)	(0.0152)	(0.0131)	(0.0172)	(0.0436)	(0.0596)	(0.0384)	(0.0541)
CF volatility	0.4394***	0.5589***	0.4367***	0.5564***	0.0571	0.0700	0.3857***	0.4917***	0.7892***	1.0367***	0.1400***	0.1579**
	(0.0401)	(0.0529)	(0.0313)	(0.0405)	(0.0366)	(0.0490)	(0.0397)	(0.0523)	(0.0494)	(0.0675)	(0.0455)	(0.0632)
Promoter	-0.0306***	-0.0372***	-0.0239***	-0.0289***	-0.0266**	-0.0335**	-0.0230***	-0.0289***	-0.0225**	-0.0264*	-0.0118**	-0.0144**
	(0.0084)	(0.0109)	(0.0027)	(0.0042)	(0.0110)	(0.0145)	(0.0085)	(0.0110)	(0.0107)	(0.0146)	(0.0049)	(0.0063)
Lagged cash holdings	-	-	-	-	-	-	-	-	-	-	0.5406***	0.5173***
	-	-	-	-	-	-	-	-	-	-	(0.0640)	(0.0761)
Intercept	0.0697***	0.0831***	0.0448***	0.0469***	0.0413**	0.0480*	0.0587***	0.0689***	0.0816***	0.0999***	0.0616*	0.0780
	(0.0112)	(0.0149)	(0.0112)	(0.0142)	(0.0196)	(0.0256)	(0.0099)	(0.0129)	(0.0195)	(0.0267)	(0.0330)	(0.0537)
Time Period	2001-16	2001-16	2001-16	2001-16	2001-16	2001-16	2001-16	2001-16	2001-16	2001-16	2001-16	2001-16
Firm-year observations	7350	7352	7350	7352	7350	7352	7350	7352	7350	7352	6991	6994
No. of firms	672	672	-	-	672	672	672	672	672	672	671	671
R Squared	0.168	0.156	0.208	0.196	0.093	0.084	0.223	0.205	0.399	0.376	-	-
F-statistic	23.97***	20.77***	147.23***	109.66***	9.04***	7.70***	-	-	43.80***	39.78***	-	-
Hausman test statistic	-	-	-	-	329.44***	-	-	-	-	-	-	-

Hausman test statistic	-	-	-	-	329.44***	-	-	-	-	-	-	-
Year dummies	-	-	-	-	Yes	Yes	Yes	Yes	-	-	Yes	Yes
No. of instruments	-	-	-	-	-	-	-	-	-	-	53	43
AB AR(1) test p-value	-	-	-	-	-	-	-	-	-	-	0	0
AB AR(2) test p-value	-	-	-	-	-	-	-	-	-	-	0.1547	0.2226
Sargan-Hansen test p-value	-	-	-	-	-	-	-	-	-	-	0.3554	0.1804

This table shows results for regressions of corporate cash holdings on firm-specific characteristics for an unbalanced dataset of 1696 Indian non-financial firms. For robustness purposes, we use two proxies for the dependent variable: cash and cash equivalents/total assets i.e. Cash/TA and cash and cash equivalents/(total assets-cash and cash equivalents) i.e. Cash/NA. Time fixed effects have been included (not reported due to space constraints) to control the impact of cross-section invariant variables (such as macroeconomic factors) in fixed effects and system GMM regressions. Coefficients for firm fixed effects and industry fixed effects are not reported for the sake of brevity. For pooled OLS, fixed effects and system GMM regressions, parentheses contain heteroscedasticity-robust standard errors clustered at firm-level. For Fama-MacBeth and between effects models, ordinary standard errors are reported in parentheses. Within R-squared is reported for fixed effects regressions. System GMM regressions are based on two-step estimation procedure as it provides coefficients with lower bias and standard errors robust to heteroscedasticity (Windmeijer, 2005). In order to ensure minimum loss of data due to missing observations, forward orthogonal deviations are used for obtaining transformed equation (Roodman, 2009). System GMM regressions consider lagged cash holdings, leverage, liquidity, dividend payment, growth potential and capital expenditure as endogenous explanatory variables. The lag lengths of GMM style instruments of endogenous variables vary between one and fourteen periods. The p-values of AB AR(1) and AB AR(2) tests correspond to Arellano and Bond (1991) test statistics with null hypotheses of absence of first and second order serial correlation in residuals respectively. The p-value of Sargan-Hansen corresponds to a test of over-identifying restrictions with null hypothesis of instrument validity (Sargan, 1958; Hansen, 1982). The number of firms and firm-year observations are different for each model due to unbalanced nature of the dataset. * denotes significance at 0.10 level (2-tailed), ** denotes significance at 0.05 level (2-tailed) and *** denotes significance at 0.01 level (2-tailed). Details regarding abbreviations and definitions of variables are presented in Table 1.

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5. CONCLUSION

Corporate cash decisions have far-reaching consequences not only for firms but for the entire economy. At firm level, deficit of cash may result in loss of profitable business opportunities and financial distress whereas surplus of cash may lead to violation of shareholders' wealth maximisation and agency problems. For the economy, insufficient corporate liquidity may imply curtailed investments, weaker economic growth and systemic risk in the form of corporate defaults whereas excess corporate cash may signify inefficient allocation of resources. We examine the relationship between firm-specific characteristics and corporate cash holdings for a sample of Indian non-financial firms spread across 61 industries. Considering a sample period from 2001 to 2016, we provide empirical evidence to show that corporate cash holdings are negatively associated with firm size, leverage, liquidity, capital expenditure and promoter ownership. Further, results suggest that firms with higher levels of profitability, operating cash flow and cash flow volatility have relatively high cash holdings. We do not find concrete empirical evidence to show that corporate cash holdings of Indian non-financial firms are related to growth potential and dividend payment. Furthermore, these results are robust across five estimation techniques and two proxies of corporate cash holdings. In order to ascertain the speed of adjustment of cash holdings of a typical Indian non-financial firm, we use system GMM estimator. The findings reveal that firms achieve target cash levels in a time span of 2.18 years (or approximately 26 months) on an average. The study serves a reference point for managers, practitioners and policy makers by providing insights on firm-specific factors which influence corporate cash holdings in an emerging market setup. For instance, in light of our findings, managers of firms with high cash flow volatility should ideally hold additional cash reserves (*ceteris paribus*) to mitigate the possibility of a cash shortfall. Further, managers of firms with higher levels of net working capital (excluding cash and cash equivalents) should ideally hold lesser cash and cash equivalents (*ceteris paribus*) since current assets like accounts receivables may be used as substitutes of cash during a liquidity crunch. In addition to contributing towards existent literature on determinants and speed of adjustment of corporate cash holdings, our results also suggest multiple directions for future research. First, researchers may undertake an industry-specific

analysis of determinants of corporate cash holdings in order to ascertain the relevance and significance of each firm-specific characteristic in explaining variation in cash holdings across different industries. Second, keeping in view the dearth of literature on determinants of cash holdings of financial firms, researchers may identify factors which influence cash levels of financial firms. Third, researchers may also analyse the variation in speed of adjustment of cash holdings across different industries. Fourth, researchers may investigate the determinants of speed of adjustment of cash holdings.

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