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Determinants of Cash Holdings: A Study of Manufacturing Firms in India

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ABSTRACT

This article investigates the determinants of cash holdings of Indian manufacturing firms. We investigate firm specific determinants such as Firm Size, Growth Opportunities, Leverage, Cash Flow, Dividend, Net Working Capital, R&D Expenditure, Assets Tangibility, Profitability, Interest Expenses, Cash Conversion Cycle, Inverse of Altman's Z score, Firm Age and Cash Flow Volatility using a sample of 500 manufacturing firms for a period from 2005-2017. The study finds that Growth Opportunities, Leverage, Cash Flow, Dividend, Net Working Capital, R&D Expenditure and Profitability positively affect cash holdings whereas Firm Size, Assets Tangibility and Interest Expenses negatively affect cash holdings. Further, Firm Size and Growth Opportunities support the trade-off theory. Cash Flow and Profitability support the pecking order theory. Moreover, Growth Opportunities support both trade-off theory and pecking order theory. However, Cash Conversion Cycle, Inverse of Altman's Z score, Firm Age and Cash Flow Volatility have insignificant impact on cash holdings.

Keywords: Cash holdings; Determinants; Trade-off theory; Pecking order theory; Agency theory
JEL Classification: G30; G32

INTRODUCTION:

Corporate cash management plays a pivotal role in administering corporate finance and no business is isolative of it. There are several theories such as trade-off theory (Keynes, 1936), pecking order theory (Myers & Majluf, 1984) and agency theory (Jensen, 1986) that explain the cash management. Cash[1] is king and it is the means as well as end of every business. So looking at the importance of cash, every business keeps certain portion of their current assets in the form of cash which is called as transaction motive (Keynes, 1936) of holding cash. Besides the transaction motive there are some other motives of holding cash such as precautionary motive (Keynes, 1936), speculative motive (Keynes, 1936), agency motive (Jensen, 1986), firm's value motive, compensating balance requirement and strategic motive. Though holding of cash is backed by certain motive, all these motives of holding cash have certain benefits as well as cost to the business.

Now-a-days, the process of managing cash has been greatly influenced by new developments in the business world. These developments include change in firm characteristics as well as macroeconomic scenario. The change in firm characteristics has been seen in ownership, expectation of stakeholders, capital structure, size, age, composition of assets & liabilities, cash flow, research & development, profitability, business diversification etc. Many studies have focused on developed markets but least of the research such as Anand et al. (2012), Al-Najjar (2013), Gautam et al. (2014), Saluja & Drolia (2015), Cheung (2016) and Maheshwari & Rao (2017) have focused on firm specific parameters of Indian firms.

[1] Cash includes cash and cash equivalents.

This study is an extension of prior studies adding new dimensions such as Interest expenses, Cash conversion cycle and Inverse of Altman's Z score in Indian context. The objective of this study is to examine the relationship between firm specific parameters and cash holdings of manufacturing firms in Indian context. Firm specific parameters such as Firm size, Growth opportunities, Leverage, Cash flow, Dividend, Net working capital, R&D expenditure, Assets tangibility, Profitability, Interest expenses, Cash conversion cycle, Inverse of Altman's Z Score, Firm age and Cash flow volatility are considered for studying their impact on cash holdings. The sample period is from 2005 to 2017 having a sample of 500 Indian manufacturing firms.
The study finds that major factors have impact on cash holdings of manufacturing firms in India. The factors such as Growth opportunities, Leverage, Cash flow, Dividend, Net working capital, R&D expenditure and Profitability have positive impact on cash holdings. The factors such as Firm size, Assets tangibility and Interest expenses have negative impact on cash holdings.
The rest part of this article is organised as follows. The section titled 'Review of Literature' discusses the literature on firm specific determinants of cash holdings and cash holdings scenario in India followed by research gap, research question, objectives of the study, scope of the study and rationale of the study. The subsequent section titled 'Research Methodology' deals with sample selection, data description and model specification. The next section titled 'Empirical Results and Discussion' illustrates the descriptive statistics, regression result and findings. The last section concludes the study.

REVIEW OF LITERATURE:

This section discusses the impact of firm specific parameters on cash holdings from different perspectives.

Firm Size:

This study uses firm size as a proxy for firm's ability to access capital markets. Trade-off theory posits that small firms hold large cash. This is for the reason that small firms face difficulties in raising funds from capital market as they are young, less known and more sensitive to capital market imperfection (Almeida et al. 2002). Also the small firms suffer from information asymmetry problem as compared to large firms because small firms could not be able to catch the attention of the analysts and investors as a result external financing becomes costlier. Kim et al. (1998) used firm size as a proxy for cost of external financing. Further, as suggested by Miller and Orr (1996), there exists economies of scale in cash management and the large firm holds less cash than small firm as raising capital by the small firm is relatively costlier than large firm.
On the other hand, firm size positively affects cash holdings as per pecking order theory. This is because large firms are presumed to be successful therefore they hold large cash after meeting investment need (Ferreira & Vilela, 2004). Further, Agency theory also posits a positive impact of size on cash holdings. This is because large firms have wide shareholder dispersion that leads to more managerial discretion over investment and cash holdings.
Chauhan et al. (2018), Hu et al. (2018), Nyborg & Wang (2014), Anjum & Malik (2013), Ali & Yousaf (2013), Gogineni et al. (2012), Gill & Shah (2012), Megginson & Wei (2012), Islam (2012), Bates et al. (2009), Drobetz & Gruninger (2006), Nguyen (2005), Ferreira & Vilela (2004), Opler et al. (1999), Kim et al. (1998), Al-Najjar (2013), Sun et al. (2012) and Bashir (2014) reveal a negative association of size with cash holdings implying small firms hold more cash than large firms. However, Mesfin (2016), Ajao et al. (2012), Shah (2011), Afza & Adnan (2007), Teruel et al. (2009), Stone & Gup (2013) reveal a positive association of size with cash holdings implying small firms hold less cash than large firms. This study expects a negative association between firm size and cash holdings to prevail. Following the measure of Opler et al. (1999) and Ferreira & Vilela (2004), this study measures firm size as natural logarithm of net assets[2].

Growth Opportunities:

Trade-off theory expects a firm with growth opportunities to have higher cash holdings. This is because relying on internal financing decreases the probability of a firm to forgo investment opportunities and prevents costly external financing. The prediction of pecking order theory aligns with trade-off theory but the perspective differs. The trade-off theory argues from transaction cost perspective while pecking order theory argues from precautionary motive perspective where firms are assumed to be restricted from external financing. As per agency theory entrenched managers with poor investment opportunities hold more cash to invest in negative NPV projects that dissipates shareholders value (Ferreira & Vilela, 2004 and Drobetz & Gruninger, 2007).
Higher growth opportunities increase the market value of the firm in relation to its book value (Smith & Watts,

[2] Net assets means total assets minus cash and cash equivalents.

1992 and Barclay & Smith, 1995). As firm's balance sheet does not reflect information on growth opportunities, Kim et al. (1998) and Opler et al. (1999) used market-to-book value of assets ratio as a proxy for growth opportunities. As the market value of assets are not also available in the firm's balance sheet, following the measure taken by earlier researchers like Ferreira & Vilela (2004), Chen & Mahajan (2010), Subramaniam et al. (2011), Megginson & Wei (2012), Newton et al. (2015) and Hu et al. (2018), this study calculate the market value of the firm's assets using a surrogate measure as the book value of assets minus book value of equity plus market value of equity. The market-to-book ratio is calculated as the ratio of market value of net assets to book value of net assets. Researches by Chauhan et al. (2018), Hu et al. (2018), Maheshwari & Rao (2017), Mesfin (2016), Nyborg & Wang (2014), Bashir (2014), Ali & Yousaf (2013), Sun et al. (2012), Megginson & Wei (2012), Ajao et al. (2012), Shah (2011), Kim et al. (2011), Bates et al. (2009), Hofmann (2006), Nguyen (2005), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), Opler et al. (1999) and Kim et al. (1998) reveal a positive impact of growth opportunities on cash holdings. On the other hand researches by Mugumisi & Mawanza (2014), Shah et al. (2012) and Teruel et al. (2009) reveal a negative impact of growth opportunities on cash holdings. However, Islam (2012) and Drobetz & Gruninger (2006) reveal the relationship to be insignificant. This study expects a positive impact of growth opportunities on cash holdings.

Leverage:
Firms with higher leverage hold higher liquid assets as leverage enhances the likelihood of financial distress. Cash also reduces the likelihood of underinvestment problem (Trade-off theory) which is more articulated with the presence of risky debts. Pecking order theory also posits a positive relationship of leverage with cash holdings on the view that debt increases when firm exhaust all its internal resources in financing the investments that reduces cash holdings. Agency theory states that high leveraged firms are subject to more monitoring and debt covenants by the creditors which reduces the discretion of managers to hold large cash. Following Opler et al. (1999), Ferreira & Vilela (2004), D' Mello et al. (2005), Khaoula & Saddour (2006), Drobtz & Gruninger (2006), Niskanen & Niskanen (2007), Capkun & Weiss (2007), Bates et al. (2009), Ran Duchin (2010), Chen & Mahajan (2010), Subramaniam et al. (2011) and Gao et al. (2013), we can expect a negative relationship of leverage with cash holdings. However, Steijvers et al. (2009), Gill & Shah (2012), Ajao et al. (2012) and Bashir (2014) reveals a positive relationship of leverage with cash holdings. Leverage is measured as ratio of total debt to net assets.

Cash Flow:
Cash flow is a ready source of liquidity for the firms. Hence, we can expect a negative relationship between cash flow and cash holdings (Trade-off theory). In line with this prediction, Kim et al. (1998), Hardin et al. (2009), Subramaniam et al. (2011), Islam (2012) and Nyborg & Wang (2014) reveals a negative relationship between cash flow and cash holdings.
Pecking order theory is upon the view that firms generating more cash flow from operation tend to accumulate more cash balances than firms with less cash flow. In line with this prediction Opler et al. (1999), Duchin (2010), Chen & Mahajan (2010), Chauhan et al. (2018), Hu et al. (2018), Mesfin (2016), Mugumisi & Mawanza (2014), Ali & Yousaf (2013), Megginson & Wei (2012), Ajao et al. (2012), Drobetz & Gruninger (2006), Maheshwari & Rao (2017), Teruel et al. (2009), Sun et al. (2012) and Stone & Gup (2013) demonstrate a positive relationship of cash flow with cash holdings.
However, study by Anderson (2002) and Bashir (2014) find this relationship to be insignificant. This study expects a positive relationship between cash flow and cash holdings. To measure the magnitude of the cash flow, the study uses cash flow from operation to net assets ratio.

Dividend:
The predicted relationship between cash holdings and dividend payment is unclear under trade-off theory. Firm that pays dividend can raise capital from the market at low cost and the firm that does not pay dividend has to raise capital from the internal sources because for such firm external financing will be costlier. Hence, a negative association between dividend payment and cash holdings is expected to prevail as documented by Hu et al. (2018), Nyborg & Wang (2014), Kim et al. (2011), Adnan et al. (2007), Hofmann (2006), Opler et al. (1999), Al-Najjar (2013), Sun et al. (2012) and Stone & Gup (2013).
On the other hand, large cash holdings increase the dividend payment. Hence, a positive association is also expected between dividend payment and cash holdings as documented by Ozkan & Ozkan (2004), Chauhan et al. (2018), Mugumisi & Mawanza (2014), Ali & Yousaf (2013), Gogineni et al. (2012), Shah (2011), Drobetz &

Gruninger (2006), Nguyen (2005), Maheshwari & Rao (2017) and Teruel et al. (2009).
But Shah et al. (2012) reveal an insignificant association of dividend with cash holdings. Following the measure of Opler et al. (1999), Ferreira & Vilela (2004), Chen & Mahajan (2010) and Subramanian et al. (2011), this study uses dummy variable for dividend that takes a value 1 if a firm pays dividend and 0 otherwise.

Net Working Capital:
Trade-off theory expects a negative relationship of net working capital with cash holdings because assets with ready market value or assets that can be easily convertible into cash serve as a substitute for holding extra cash. The net working capital is used as a proxy for liquid assets substitute.
Ozkan & Ozkan (2004) argue that cost of liquidating current assets into cash is much lower than other assets. So a firm with more receivables and inventory is supposed to have less cash holdings implying a negative relationship between net working capital and cash holdings. This relationship is supported by Chauhan et al. (2018), Hu et al. (2018), Mesfin (2016), Mugumisi & Mawanza (2014), Nyborg & Wang (2014), Ali & Yousaf (2013), Gogineni et al. (2012), Gill & Shah (2012), Megginson & Wei (2012), Ajao et al. (2012), Kim et al. (2011), Bates et al. (2009), Hofmann (2006), Ferreira & Vilela (2004), Al-Najjar (2013), Maheshwari & Rao (2017), Teruel et al. (2009), Sun et al. (2012), Stone & Gup (2013), Bashir (2014) and Opler et al. (1999).
Following the measurement used by Oppler et al. (1999), Subramanian et al. (2011), Duchin (2010), Gao et al. (2013) and Ferreira & Vilela (2004), it is measured as ratio of net working capital minus cash to net assets.

R&D Expenditure:
Now-a-days manufacturing firms are making huge expenditure in research and development for bringing innovation in product, process, methods of production, machinery and equipments etc. Expenditure in research and development involves huge cash outflow. So the firms making research & development expenditure are assumed to hold less cash. It is because R&D driven innovations are difficult to finance through external financing due to its uncertain outcome, intangible nature and asymmetric information problems. Thus, R&D is largely financed using internal cash flows and equity issues. In line with this proposition, Bates et al. (2009) and Maheshwari & Rao (2017) reveal a negative relationship of R&D with cash holdings. This study also expects a negative relationship between R&D and cash holdings.
On the other hand, firms making expenditure on R&D are expected to generate huge cash inflows in the form of increased sales revenue. In line with this argument, Chauhan et al. (2018), Hu et al. (2018), He & Wintoki (2016) and Wang et al. (2014) reveal a positive relationship of R&D with cash holdings. Following the study of Gao et al. (2013), Foley et al. (2007) and He & Wintoki (2016), R&D is measured as ratio of R&D expenditure to net assets.

Assets Tangibility:
Fixed assets are considered to be the substitute for cash because in case of cash short fall the firm can liquidate its tangible assets. Further, firms with more collateral as fixed assets encounter less problem in issuing debt. Hence, such firms have less need to hold cash reserve. Therefore, firms with more tangible assets are expected to hold less cash. In line with this proposition, Islam (2012), Drobetz & Gruninger (2006) and John (1993) find a negative relationship of assets tangibility with cash holdings. This study uses fixed assets to net assets ratio as measure of assets tangibility.

Profitability:
Trade-off theory states that more profitable firms hold less cash as profit is an immediate source of liquidity. Hence, profitability and cash holdings are negatively associated as demonstrated by Pinkowitz & Williamson (2001) and Al-Najjar (2013).
However, pecking order theory is on the view that more profitable firms tend to accumulate more cash holdings for future requirements. Hence, a positive relationship between profitability and cash holding is expected to prevail as demonstrated by Opler et al. (1999), Nguyen (2005), Megginson & Wei (2012), Ajao et al. (2012), Ali & Yousaf (2013), Mugumisi & Mawanza (2014) and Chauhan et al. (2018). Profitability is measured as ratio of EBIT to net assets.

Interest Expenses:
Interest expenses involve outflow of funds from the business for meeting fixed obligations. Hence, one can expect a negative relationship of interest expenses with cash holdings. On the other hand, inability of a firm to meet interest obligations in time signals its insolvency and firm incurring more interest expenses encounters

problems in raising further debt due to the premium charged by the debt holder for assuming more risk which makes the debt costlier. So firm incurring more interest expenses needs to hold more cash to finance new investments. This study expects a positive association between interest expenses and cash holdings. Interest expenses is measured as ratio of interest expenses to net assets.

Cash Conversion Cycle:
In manufacturing concern the length of the cash conversion cycle (CCC) influences the amount of cash to be held by the firms. A shorter cash conversion cycle means better timing of cash inflows and out flows that reduces the need for holding cash as revealed by Drobetz & Gruninger (2006). Hence, one can expect a positive relationship between CCC and cash holdings. At the same time a negative relationship between CCC and cash holdings is also expected as longer CCC leads to large amount of receivables and inventories which are more liquid than any other types of assets and long CCC also means less payables that need to paid on short notice (Deloof, 2001). Hence, longer CCC is an additional source of liquidity for the firm. This proposition is supported by findings of Song et al. (2014), Shah (2011), Kim et al. (1998) and John (1993). This study expects a negative association between CCC and cash holdings. Cash conversion cycle is measured as natural logarithm of inventory conversion period plus debtor conversion period minus creditor deferment period.

Inverse of Altman's Z Score:
Financial distress brings many costs to a firm. Such costs may be directly associated with bankruptcy process or reduction in sales revenue due to loss of confidence of customers on firm's survival. Further, the pressure of reduced financial condition adversely affects management initiatives such as R&D, employee training etc. In order to avoid all such costs associated with financial distress, firms need to maintain higher cash holdings. Hence one can expect a positive relationship of financial distress with cash holdings as revealed by Bashir (2014). On the other hand, financially distressed firms are expected to have low cash holdings (Kim et al. 1998 and Teruel et al. 2009). Therefore, this study expects that possibility of financial distress negatively affects cash holdings.
We use inverse of Altman's (1968) Z score to measure the probability of financial distress. As higher Z score show lower probability of financial distress, following MacKie-Mason (1990), Kim et al. (1998) and Drobetz & Gruninger (2006), we use inverse of the adjusted version of the Altman's Z score. While calculating the adjusted version of the Altman's Z score the term working capital to total assets ratio has not been included to avoid the problem circularity in two ways. In one way, as this study aims at explaining the determinants of cash holdings and cash holdings also form a part of the working capital, so the term working capital to total assets ratio has not been included in measuring the Altman's Z score. In another way, as net working capital to net assets ratio has also been taken as a separate determinant of cash holdings, so exclusion of such term from the Altman's Z score is highly logical.

Firm Age:
Age is expected to have positive relationship with cash holdings on the ground that new firms generate low cash inflows and at initial stage the investment needs are very high leading to high cash outflows.
On the other hand, age is expected to have negative relationship with cash holdings because old and established firms are less prone to information asymmetry hence they are capable of raising capital from the market at less cost than new firms. Further, the cost of raising capital for the new firms are high for the reason being they encounters the problem of information asymmetry and as investors are not certain about the performance of new firms they charge premium for their high risk perception. As a result the new firms are expected to hold more cash to meet their investment needs (Wang et al. 2014 and Gogineni et al. 2012). Age is measured as natural logarithm of number of year since incorporation of a firm. This study expects a negative relationship between firm age and cash holdings.

Cash Flow Volatility:
Trade-off theory states that higher volatility in cash flow means more chances of cash shortfall at any point of time. As cash shortfall brings many costs to a firm like cost of bankruptcy, forgoing profitable projects etc., cash holdings provide a buffer in such case. Hence, this proposition suggests a positive association between cash flow volatility and cash holdings. This relationship is established by Hu et al. (2018), Nyborg & Wang (2014), Gogineni et al. (2012), Megginson & Wei (2012), Bates et al. (2009), Hofmann (2006), Nguyen (2005), Opler et al. (1999) and Kim et al. (1998). Cash flow volatility is measured as the volatility of a firm's cash flow from operation over the time period. It is the mean of the standard deviations of cash flow over net assets. This study

expects a positive impact of cash flow volatility on cash holdings.
Appendix A summarises the relationship between firm-specific determinants and Cash holdings as demonstrated by prior studies.

Cash Holdings in Indian Scenario:

The different aspects of cash holdings have been studied extensively in global context, especially from the perspective of US and UK. Though India has large number of listed firms, still the study concerning determinants of cash holdings from Indian perspective is limited. This section deals with the cash holdings scenario in Indian context from different perspectives.
Paskelian & Nguyen (2010) find that highly concentrated family owned firms have low cash holdings to manage their business. In the same line Ananda et al. (2012) find that family owned firms and group firms hold low cash. The reasons of such low cash holdings are attributed to the fact that low cash holdings limit the opportunities for private benefits. However, Anand et al. (2012) find that government owned firms, private firms and foreign firms hold more cash which is associated with more opportunities for private benefits. Classifying firms into financially constrained and financially unconstrained, Gautam et al. (2014) document that financially unconstrained firms hold more cash in comparison to financially constrained firms. They also further find that firm size has a positive relationship with cash holdings for financially unconstrained firms and vice versa. Saluja & Drolia (2015) find that credit rating is positively associated with cash holdings. Cheung (2016), in the context of corporate social responsibility (CSR), finds that CSR is positively associated with cash holdings. In a cross country analysis among USA, Russia, UK, Brazil, China and India, Al-Najjar (2013) finds that firm specific determinants such as Leverage, Liquidity, Firm Size, Profitability, Dividend and Shareholders right have negative relationship with cash holdings in Indian context. Consistent with Al-Najjar (2013), Maheshwari & Rao (2017) find that firm specific determinants such as Cash Flow, Dividend, Market-to-Book ratio, Net Debt Issuance and Net Equity Issuance are positively associated with cash holdings whereas Net Working Capital, Leverage, R&D and Capital Expenditure are negatively associated with cash holdings. Analysing the impact of bank appointed director on cash holdings, Chauhan et al. (2018) find that firms having bank-appointed directors hold lesser cash than firms not having bank-appointed directors**.** Furthermore, they find that Return on Assets, Tobin's Q, Cash Flow Volatility, R&D and Dividend have positive impact on cash holdings whereas Firm Size, Leverage, Net Working Capital and Capital Expenditure have negative impact on cash holdings. Bhat & Bachhawat (2005) find that firms having more block-shareholders and corporate shareholdings have less cash holdings. Further, the study states that leverage and assets tangibility have negative association with cash holdings whereas group affiliation, dividend, firm size and net worth do not have significant association with cash holdings.

RESEARCH GAP:

In the literature section, this study finds that most of the studies have focused on developed countries like USA, UK etc. and least researchers have focused on emerging countries. Our study is different in two aspects. Firstly, emerging country like India is taken as a sample and secondly, firm specific parameters such as Interest expenses, Cash conversion cycle and Inverse of Altman's Z score are considered as determinants in our model which are unnoticed by prior researchers in Indian context.

RESEARCH QUESTIONS:

Consistent with research gap, the following research questions have been developed.

- Do firm specific parameters determine cash holdings of manufacturing firms in India?
- To what extent firm specific parameters have impact on cash holdings?

OBJECTIVES OF THE STUDY:

The objectives of this study are:

- To explore the firm specific determinants of cash holdings of manufacturing firms in India.
- To measure the degree of influence of firm specific parameters on cash holdings.

SCOPE OF THE STUDY:

The scope of this study is limited to firm specific parameters and country context. This study has focused on fourteen firm specific parameters such as Firm size, Growth opportunities, Leverage, Cash flow, Dividend, Net

Working Capital, R&D Expenditure, Assets Tangibility, Profitability, Interest Expenses, Cash Conversion Cycle, Inverse of Altman's Z Score, Firm Age and Cash Flow Volatility as determinant of cash holdings. Further, the study is confined to Indian manufacturing firms.

RATIONALE OF THE STUDY:

Cash management especially cash holdings is of growing importance in present time. Now-a-days many firms are sitting on the cash piles whereas many firms are suffering from liquidity crisis. This is because of inaccurate understanding of the behavior of firm specific parameters and their impact on cash management policy of the firms. So it is highly necessary to analyse the firm specific determinants and their relationship with cash holdings of the firms. Though several studies have been undertaken to investigate the firm specific parameters determining the level of cash holdings of firms in different countries, less studies have been undertaken in India. In the light of above background, this study aims at exploring the firm specific parameters and analysing their impact on cash holdings of the firms in Indian context.

RESEARCH METHODOLOGY:

This section discusses the sample selection, data description and model specification.

Sample Selection and Data Description:

The data used in this study relate to Indian manufacturing firms listed in both National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) and the data has been collected from PROWESS data base of CMIE (Centre for Monitoring Indian Economy). This study is confined to listed manufacturing firms because the listed firms follow the norms prescribed by Securities and Exchange Board of India (SEBI) for financial reporting. Banking and financial services firms are excluded from the sample as their regulation and financial reporting practice differ from others. In addition, firms with missing data are also excluded from the sample. Thus, a data set of 6500 firm-year observations is obtained for 500 firms during the period from 2005 to 2017. The period of the study is from 2005 to 2017 (i.e. from financial year 2004-2005 to 2016-2017). Sample selection criteria, given in Table 1 and 2, shows sample selection and industry wise sample distribution. Sample distribution is based on two-digit National Industrial Classification (NIC) code and total sample of 500 companies are classified into 11 industries.

Table 1: Sample Selection Procedure

Criterion	Number of Firms
Initial sample Manufacturing firm collected from Prowess database (CMIE)	17807
Minus the firms that have missing financial statement information	17307
Final sample	500

Source: Authors' own collection.

Table 2: Industry-Wise Distribution of Sample Firms

Industry Group	NIC Code	No. of Firms
Automobiles, Machinery and Tools	28, 29 & 30	76
Cement and Glass	23	35
Chemical and Chemical Products	20	67
Cotton and Textile	13	50
Diversified	34	24
Drugs and Pharmaceuticals	21	42
Steel and Iron	24 & 25	52
Sugar, Diary and Edible Products	10	36
Tyre and Rubber	22	27
Wires, Storage and Cables	27	23
Allied	11, 12, 17, 19, 26 & 32	68
Total		**500**

Source: Authors' own collection.
Note: Refer to the National Industrial Classification (NIC) code up to first two-digit level.

Model Specification:

$$CASH_{it} = \alpha_0 + \beta_1 SIZE_{it} + \beta_2 GOP_{it} + \beta_3 LEV_{it} + \beta_4 CF_{it} + \beta_5 DIV_{it} + \beta_6 NWC_{it} + \beta_7 R\&D_{it} + \beta_8 TAN_{it} + \beta_9 PFT_{it} + \beta_{10} INE_{it} + \beta_{11} CCC_{it} + \beta_{12} 1/Z_{it} + \beta_{13} AGE_{it} + \beta_{14} CFV_{it} + \varepsilon \text{-------} Eq(1)$$

Where,

$CASH_{it}$ = Cash holdings, measured as ratio of cash and cash equivalents to net assets. Net assets are calculated as total assets minus cash and cash equivalents. The underlying reason for deflating cash and cash equivalents by net assets is that a firm's ability to generate future profit depends upon its net assets. Further, the objective of deflating cash by net assets is to remove the problem of circularity. Hence, all other variables are also deflated by net assets.

$SIZE_{it}$ = Size of the firm, measured as natural logarithm of net assets.

GOP_{it} = Firm's growth opportunities, measured as market-to-book ratio. Market-to-book ratio is calculated as ratio of book value of net assets minus book value of equity plus market value of equity to net assets.

LEV_{it} = Firm's leverage, measured as ratio of total debt to net assets.

CF_{it} = Firm's cash flow, measured as ratio of cash flow from operation to net assets.

DIV_{it} = A dummy variable for dividend that takes a value 1 if a firm pays dividend and 0 otherwise.

NWC_{it} = Firm's Net working capital, measured as ratio of net working capital minus cash and cash equivalents to net assets.

$R\&D_{it}$ = Firm's Research and Development expenditure, measured as ratio of R&D expenditure to net assets.

TAN_{it} = Tangibility of firm's assets, measured as ratio of fixed assets to net assets.

PFT_{it} = Firm's profitability, measured as ratio of EBIT (Earnings before Interest and Taxes) to net assets.

INE_{it} = Firm's interest expenses, measured as ratio of interest expenses to net assets.

CCC_{it} = Length of Firm's cash conversion cycle, measured as natural logarithm of inventory conversion period plus debtor conversion period minus creditor deferment period.

$1/Z_{it}$ = Inverse of adjusted version of Altman's Z score (1968).

AGE_{it} = Firm's age, measured as natural logarithm of number of year since incorporation of firm.

CFV_{it} = Firm's Cash flow volatility, measured as the volatility of a firm's cash flow from operation over the time period. It is the mean of the standard deviations of cash flow over net assets.

EMPIRICAL RESULTS AND DISCUSSION:

This section illustrates the descriptive statistics, regression result and findings.

Descriptive Statistics:

Table 3: Descriptive Statistics

	Mean	Median	Minimum	Maximum	Std. Dev.
CASH	0.06	0.02	0.01	3.51	0.15
SIZE	8.84	8.67	4.82	15.51	1.59
GOP	1.75	1.15	-0.11	23.35	1.72
LEV	0.62	0.63	-0.47	5.37	0.25
CF	0.09	0.08	-0.49	1.07	0.10
DIV	0.76	1.00	0.00	1.00	0.43
NWC	0.40	0.20	-4.77	27.12	0.91
R&D	0.01	0.00	0.00	0.24	0.02
TAN	0.63	0.60	0.03	2.76	0.30
PFT	1.18	1.06	0.00	8.99	0.71
INE	0.03	0.02	0.00	0.29	0.02
CCC	4.34	4.48	-4.61	12.62	1.08
1/Z	0.21	0.16	-14.61	24.32	0.53
AGE	3.54	3.47	1.61	5.04	0.52
CFV	0.09	0.07	0.02	0.47	0.05

Source: Authors' own calculation.

The descriptive statistics of the firm specific parameters under study reported in Table 3, represents that average cash holdings to net assets of Indian manufacturing firms stands at 6%. Prior studies by Al-Najjar (2013),

Gautam et al. (2014) and Paskelian & Nguyen (2010) find that the average cash holdings to total assets stands at 3%, 29.87% and 18.7% respectively. Moreover, Bhat & Bachhawat (2005) and Chauhan et al. (2018) find that average cash holdings to net assets stands at 18.73% and 12.56% respectively.

Table 4: Correlation Matrix (Karl Pearson)

SIZE	GOP	LEV	CF	DIV	NWC	R&D	TAN	PFT	INE	CCC	1/Z	AGE	CFV	
1	0.15	0.01	0.00	0.11	-0.21	0.05	-0.19	-0.19	-0.08	-0.07	0.03	0.27	-0.15	**SIZE**
	1	-0.05	0.35	0.14	0.02	0.18	-0.21	0.22	-0.28	-0.13	-0.10	0.09	0.21	**GOP**
		1	-0.12	-0.32	-0.12	-0.12	0.17	0.01	0.58	-0.06	0.06	-0.12	0.04	**LEV**
			1	0.19	0.01	0.10	0.15	0.29	-0.12	-0.17	-0.08	0.02	0.12	**CF**
				1	0.10	0.11	-0.18	0.17	-0.41	-0.09	-0.13	0.07	-0.01	**DIV**
					1	0.03	-0.09	0.15	-0.11	0.00	-0.05	-0.18	0.05	**NWC**
						1	-0.11	-0.01	-0.16	-0.01	-0.04	0.00	0.17	**R&D**
							1	0.04	0.28	-0.06	0.00	-0.05	-0.07	**TAN**
								1	-0.08	-0.44	-0.18	-0.03	0.21	**PFT**
									1	0.05	0.04	-0.15	0.01	**INE**
										1	0.15	-0.02	-0.04	**CCC**
											1	0.00	0.00	**1/Z**
												1	-0.18	**AGE**
													1	**CFV**

Source: Authors' own calculation.

Table 4 shows the Karl Pearson correlation among the firm specific parameters. The correlation ranges from 0.01 to 0.58 which indicates a low correlation among the firm specific parameters. In addition, variance inflation factor is used to check the multicollinerity among the firm specific parameters. The highest VIF is 1.873 which indicates no multicollinerity among the firm specific parameters used in this study.

Regression Result:

In this section, the study has examined the impact of firm specific parameters on cash holdings as reported in table 5. The relationship between firm specific parameters and cash holdings is established using pooled ordinary least square regression for a sample of 500 Indian manufacturing firms from the period 2005 to 2017. The study has considered cash holdings (CASH) as the dependent variable and fourteen firm specific parameters such as Firm size (SIZE), Growth opportunities (GOP), Leverage (LEV), Cash Flow (CF), Dividend (DIV), Net Working Capital (NWC), Research and Development Expenditure (R&D), Assets Tangibility (TAN), Profitability (PFT), Interest Expenses (INE), Cash Conversion Cycle (CCC), Inverse of Altman's Z Score (1/Z), Firm Age (AGE) and Cash Flow Volatility (CFV) as the independent variables for studying their impact on cash holdings. Out of the above fourteen firm specific parameters, ten parameters have significant impact on cash holdings.

Table 5: Regression Result

Independent Variable	Predicted Sign	Dependent Variable	CASH		
		Coefficient	T-test	P-Values	VIF
Intercept	?	-3.455	-16.033	0.00	
SIZE	-	-0.142***	-11.413	0.00	1.294
GOP	+	0.064***	5.245	0.00	1.433
LEV	-	1.281***	14.620	0.00	1.623
CF	+	1.659***	8.102	0.00	1.332
DIV	-	0.353***	7.572	0.00	1.322
NWC	-	0.100***	4.929	0.00	1.126
R&D	-	4.377***	3.923	0.00	1.088
TAN	-	-0.273***	-4.230	0.00	1.26
PFT	+	0.183***	6.059	0.00	1.541
INE	+	-20.697***	-19.246	0.00	1.873
CCC	-	-0.027	-1.440	0.15	1.304

Independent Variable	Predicted Sign	Dependent Variable	CASH		
		Coefficient	T-test	P-Values	VIF
1/Z	-	-0.044	-1.291	0.20	1.062
AGE	-	-0.008	-0.217	0.83	1.168
CFV	+	0.071	0.179	0.86	1.184
F- test		F(14, 6485)	104.76	0.00	
Adjusted R^2		0.18			
Observations		6500			

Source: Authors' own calculation.
Note: ***, ** and * indicate significant level at 1%, 5% and 10% respectively.

Adjusted R^2 is 0.18, which indicates that model has 18 percentage of explanatory power for predicting the cash holdings. This result supports the prior studies such as Foley et al. (2007) reported 0.04 in USA context, Gao et al. (2013) reported 0.18 in USA context, Hardin et al. (2009) reported 0.19 in USA context, Ozkan & Ozkan, (2004) reported 0.24 in UK context. In cross country context, Dittmar et al. (2003) reported 0.12. F statistics is 104.76 with p value 0.00 indicates that firm specific parameters have significant explanatory power to explain the model. The firm specific parameters are discussed in the following section.

Firm size (SIZE) is negatively associated with cash holdings (-0.142, p-value 0.00) which indicates that big firms hold less cash due to less information asymmetry problem which makes the cost of external financing cheaper. It supports the trade-off theory. This result is consistent with Chauhan et al. (2018), Hu et al. (2018), Nyborg & Wang (2014), Anjum & Malik (2013), Ali & Yousaf (2013), Gogineni et al. (2012), Gill & Shah (2012), Megginson & Wei (2012), Islam (2012), Bates et al. (2009), Drobetz & Gruninger (2006), Nguyen (2005), Ferreira & Vilela (2004), Kim et al. (1998), Sun et al. (2012), Opler et al. (1999), Al-Najjar (2013) and Bashir (2014).

A positive association between growth opportunities (GOP) and cash holdings (0.064, 0.00) indicates that growth oriented firms require more funds for investment. This positive association aligns with the prediction of both trade-off theory and pecking order theory. This finding is similar to the findings of Chauhan et al. (2018), Hu et al. (2018), Mesfin (2016), Nyborg & Wang (2014), Ali & Yousaf (2013), Megginson & Wei (2012), Ajao et al. (2012), Shah (2011), Kim et al. (2011), Bates et al.(2009), Hofmann (2006), Nguyen (2005), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), Opler et al. (1999), Kim et al. (1998), Maheshwari & Rao (2017), Sun et al. (2012) and Bashir (2014).

Leverage (LEV) is found to have positive relationship with cash holdings (1.281, 0.00) which states that firms depend on borrowed funds for holding cash and highly leveraged firm hold more cash to avoid financial distress. This finding is similar to Steijvers et al. (2009), Gill & Shah (2012), Islam (2012), Ajao et al. (2012) and Bashir (2014).

The result depicts a positive relationship between cash flow (CF) and cash holdings (1.659, 0.00). It supports the pecking order theory that firm with more cash flow from operation tends to hold more cash balances than firms with less cash flow. This result supports the earlier studies of Opler et al. (2004), Fereira & Vilela (2004), Duchin (2010), Chen & Mahajan (2010), Chauhan et al. (2018), Hu et al. (2018), Mesfin (2016), Mugumisi & Mawanza (2014), Ali & Yousaf (2013), Gill & Shah (2012), Megginson & Wei (2012), Ajao et al. (2012), Afza & Adnan (2007), Drobetz & Gruninger (2006), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), Opler et al. (1999), Maheshwari & Rao (2017), Teruel et al. (2009), Sun et al. (2012) and Stone & Gup (2013).

The study shows a positive relationship between dividend (DIV) and cash holdings (0.353, 0.00). The reason can be assigned to the fact that dividend paying firms do not want to skip dividend therefore hold larger cash. It supports the findings of earlier studies by Ozkan & Ozkan (2004), Chauhan et al. (2018), Mugumisi & Mawanza (2014), Ali & Yousaf (2013), Gogineni et al. (2012), Shah (2011), Drobetz & Gruninger (2006), Nguyen (2005), Maheshwari & Rao (2017) and Teruel et al. (2009).

Net working capital (NWC) is found to be positively associated with cash holdings (0.1, 0.00). It supports the proposition that firms with short cash conversion cycle get their working capital converted into cash quickly which leads to higher cash holdings and firms keep major portion of the net working capital in the form of highly liquid assets.

The study finds a positive association between R&D expenditure (R&D) and cash holdings (4.377, 0.00). This is because firms making expenditure on research and development generate huge cash inflows in form of increased sales revenue. This finding is consistent with earlier studies by Chauhan et al. (2018), Hu et al. (2018), He & Wintoki (2016) and Wang et al. (2014).

The study finds that assets tangibility (TAN) is negatively associated with cash holdings (-0.273, 0.00). This

suggests that if there is short fall of cash, firms use fixed assets as a substitute. Further fixed assets are used as collateral security to finance their short fall of cash. This finding is in line with Islam (2012), Drobetz & Gruninger (2006) and John (1993).

Profitability (PFT) is positively related to cash holdings (0.183, 0.00) which support the pecking order theory. The result can be interpreted as firms with better performance accumulate cash reserves for future investment. This result supports the prior studies by Opler et al. (1999), Chauhan et al. (2018), Mugumisi & Mawanza (2014), Ali & Yousaf (2013), Megginson & Wei (2012), Ajao et al. (2012) and Nguyen (2005).

Interest expenses (INE) is negatively associated with cash holdings (-20.697, 0.00). It indicates that interest expenses involves outflow of fund from the business to meet the fixed obligations which reduces the cash holdings.

Firm specific parameters such as Cash Conversion Cycle (CCC), Inverse of Altman's Z Score (1/Z), Firm Age (AGE) and Cash Flow Volatility (CFV) have no significant impact on cash holdings. Though this study failed to find significant impact of these parameters on cash holdings, such parameters can be used for further study.

FINDINGS:

The study finds that Growth opportunities, Leverage, Cash flow, Dividend, Net working capital, R&D expenditure and Profitability positively affect cash holdings whereas Firm size, Assets tangibility and Interest expenses negatively affect cash holdings. Further, Firm size and growth opportunities support the trade-off theory whereas cash flow and profitability support the pecking order theory. Moreover, growth opportunities support both trade-off theory and pecking order theory. However, Cash conversion cycle, Inverse of Altman's Z score, Firm age and Cash flow volatility have insignificant impact on cash holdings.

CONCLUSION:

This study examines the relationship between firm specific parameters and cash holdings in Indian context. Firm specific parameters such as Firm size, Growth opportunities, Leverage, Cash flow, Dividend, Net working capital, R&D Expenditure, Assets tangibility, Profitability, Interest expenses, Cash conversion cycle, Inverse of Altman's Z Score, Firm age and Cash flow volatility are considered for studying their impact on cash holdings. The sample period is from 2005 to 2017 with a sample of 500 Indian manufacturing firms.

The study finds that majority of the factors have impact on cash holdings of manufacturing firms in India. The factors such as Growth opportunities, Leverage, Cash flow, Dividend, Net working capital, R&D expenditure and Profitability have positive impact on cash holdings. The factors such as Firm size, Assets tangibility and Interest expenses have negative impact on cash holdings. Whereas factors such as Cash conversion cycle, Inverse of Altman's Z score, Firm age and Cash flow volatility have insignificant impact on cash holdings.

This study is confined to manufacturing firms in India only and factors under study are not exhaustive to explain the cash holdings. The findings of this study have implications for corporate boards, managers, investors and rating agencies while taking decisions. This study can be extended to other concerns and insignificant factors can be used as further scope of research.

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Appendix A: Firm Specific Parameters and their Relationship with Cash Holdings

Variables	Author(s) and Year	Relationship with Cash Holdings
SIZE	Chauhan et al. (2018), Hu et al. (2018), Nyborg & Wang (2014), Anjum & Malik (2013), Ali & Yousaf (2013), Gogineni et al. (2012), Gill & Shah (2012), Megginson & Wei (2012), Islam (2012), Kim et al. (2011), Bates et al.(2009), Drobetz & Gruninger (2006), Nguyen (2005), Ferreira & Vilela (2004), Kim et al. (1998), Opler et al. (1999), Al-Najjar (2013), Sun et al. (2012) and Bashir (2014).	-
SIZE	Mesfin (2016), Ajao et al. (2012), Shah (2011), Afza & Adnan (2007), Teruel et al. (2009) and Stone & Gup (2013).	+
SIZE	Bhat & Bachhawat (2005).	Insignificant
GOP	Mugumisi & Mawanza (2014), Shah et al. (2012) and Teruel et al. (2009).	-
GOP	Chauhan et al. (2018), Hu et al. (2018), Maheshwari & Rao (2017), Mesfin (2016), Nyborg & Wang (2014), Bashir (2014), Ali & Yousaf (2013), Megginson & Wei (2012), Ajao et al. (2012), Sun et al. (2012), Shah (2011), Kim et al. (2011), Bates et al.(2009), Hofmann (2006), Nguyen (2005), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), Kim et al. (1998), Opler et al. (1999) and Kim et al. (1998).	+
GOP	Islam (2012) and Drobetz & Gruninger (2006).	Insignificant
LEV	Chauhan et al. (2018), Hu et al. (2018), Maheshwari & Rao (2017), Al-Najjar (2013), Ali & Yousaf (2013), Stone & Gup (2013), Gogineni (2012), Megginson & Wei (2012), Sun et al. (2012), Bates et al.(2009), Teruel et al. (2009), Afza & Adnan (2007), Nguyen (2005), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), Kim et al. (1998), Opler et al. (1999), John (1993) and Bhat & Bachhawat (2005).	-
LEV	Steijvers et al. (2009), Gill & Shah (2012), Islam (2012), Ajao et al. (2012) and Bashir (2014).	+
CF	Hardin et al. (2009), Subramaniam et al. (2011), Nyborg & Wang (2014), Islam (2012) and Kim et al. (1998).	-
CF	Opler et al. (2004), Fereira & Vilela (2004), Duchin (2010), Chen & Mahajan (2010), Chauhan et al. (2018), Hu et al. (2018), Mesfin (2016), Mugumisi & Mawanza (2014), Ali & Yousaf (2013), Gill & Shah (2012), Megginson & Wei (2012), Ajao et al. (2012), Afza & Adnan (2007), Drobetz & Gruninger (2006), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), Opler et al. (1999), Maheshwari & Rao (2017), Teruel et al. (2009), Sun et al. (2012) and Stone & Gup (2013).	+
CF	Anderson (2002) and Bashir (2014).	Insignificant
DIV	Hu et al. (2018), Nyborg & Wang (2014), Kim et al. (2011), Stulz et al.(2009), Adnan et al. (2007), Hofmann (2006), Opler et al. (1999), Al-Najjar (2013), Sun et al. (2012) and Stone & Gup (2013).	-
DIV	Chauhan et al. (2018), Mugumisi & Mawanza (2014), Ali & Yousaf (2013), Gogineni et al. (2012), Shah (2011), Drobetz & Gruninger (2006) , Nguyen (2005), Maheshwari & Rao (2017) and Teruel et al. (2009).	+
DIV	Shah et al. (2012) and Bhat & Bachhawat (2005).	Insignificant
NWC	Chauhan et al. (2018), Hu et al. (2018), Mesfin (2016), Mugumisi & Mawanza (2014), Nyborg & Wang (2014), Ali & Yousaf (2013), Gogineni et al. (2012), Gill & Shah (2012), Megginson & Wei (2012), Ajao et al. (2012), Kim et al. (2011), Bates et al.(2009), Afza & Adnan (2007), Hofmann (2006), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), Al-Najjar (2013), Maheshwari & Rao (2017), Teruel et al. (2009), Sun et al. (2012), Stone & Gup (2013), Bashir (2014) and Opler et al. (1999).	-
NWC	Islam (2012).	Insignificant

Variables	Author(s) and Year	Relationship with Cash Holdings
R&D	Bates et al. (2009) and Maheshwari & Rao (2017).	-
R&D	Chauhan et al. (2018), Hu et al. (2018), He & Wintoki (2016) and Wang et al. (2014).	+
TAN	Islam (2012), Drobetz & Gruninger (2006), John (1993) and Bhat & Bachhawat (2005).	-
PFT	Pinkowitz & Williamson (2001) and Al-Najjar (2013).	-
PFT	Chauhan et al. (2018), Mugumisi & Mawanza (2014), Ali & Yousaf (2013), Megginson & Wei (2012), Ajao et al. (2012) and Nguyen (2005).	+
PFT	Bashir (2014).	Insignificant
INE	Megginson & Wei (2012).	+
CCC	Song et al. (2014), Shah (2011), Kim et al. (1998) and John (1993).	-
CCC	Drobetz & Gruninger (2006).	+
1/Z	Kim et al. (1998) and Drobetz & Gruninger (2006).	-
1/Z	Bashir (2014).	+
AGE	Wang et al. (2014) and Gogineni et al. (2012).	-
CFV	Hu et al. (2018), Nyborg & Wang (2014), Gogineni et al. (2012), Megginson & Wei (2012), Bates et al.(2009), Hofmann (2006), Nguyen (2005), Kim et al. (1998) and Opler et al. (1999).	+
CFV	Islam (2012).	Insignificant

Source: Authors' own collection.