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The impact of institutional factors on corporate mechanism of cash adjustment – New evidence from emerging Asia

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Abstract

We study the impact of institutional level variables on the dynamics of cash holdings and its adjustment mechanisms. We use a sample of 11407 firms from seven emerging Asian countries and consider five country specific variables namely financial development, ease of access to loans, raising capital through equity markets, board efficacy and firm's spending on R&D. The results indicate that all variables except ease of access to loans are positively related to the cash holdings. We also provide evidence of asymmetry in cash adjustment mechanisms. The paper provides insights into the cash management policies of firms in emerging Asia where the business environment, institutional set up are quite distinct from developed markets. Our study also sheds light on the adjustment mechanisms of cash when the institutional level variables are considered.

JEL classification: G30, G39

Key words: Cash adjustment speed, Institutional variables, emerging Asia, excess and deficit cash

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1. Introduction

Corporate cash holdings have been a much-debated topic in corporate finance and prior studies have attempted to explain the factors determining it (Bates et.al., 2009; Riddick and Whited, 2009; Ferreira and Vilela, 2004; Faulkender and Wang, 2006; Bates et.al., 2018). These studies can be broadly classified into two categories. The first includes those which consider firm specific variables and the second which considers the variables at both the firm and country level (some papers use institutional instead of country level, we use these terms interchangeably)[2]. Further, two dimensions of cash holdings have been addressed – level of cash and changes in cash holdings. Existing studies can be classified into two groups: those which consider financial variable as determinants (Opler et.al., 1999; Harford, 1999; Ozkan and Ozkan, 2004; Mikkelson and Partch, 2003) while another strand incorporates non-financial variable also as determinants of cash (Dittmar et.al., 2003, Pinkowitz et.al., 2006, Kalcheva and Lins, 2007; Harford et.al., 2008; Khurana et.al., 2006). Although studies consider financial variable as determinants presents almost similar results, studies consider non-financial variables are still inconclusive.

In addition, studies also considered other country specific variables like anti-takeover strategy (Faleye, 2004); product market competition (Fresard, 2010), economic policy uncertainty (Demir and Ersan, 2017), corruption (Thakur and Kannadhasan, 2019), political connection of firms (Al-Dhamari and Ismail, 2014), national culture (Chen et al., 2015), national governance (Jabbouri and Almustafa, 2020). In summary, the findings in many cases are inconclusive especially in the context of markets other than the US. Therefore, there is a gap to understand the role of other institutional

[2] Kusandi and Wei (2011); Pinkowitz et al. (2006); Lee and Park (2016)

(or country level) variables on the cash holdings and its adjustment mechanism specifically in emerging market setting.

Prior literature addresses another dimension, the speed of cash adjustment (Orlova and Rao, 2018; Bates et al., 2017; Gao et al., 2013). These studies assume that the adjustment mechanism by which the firms converge to the optimal level is symmetric i.e, firms with excess or deficit cash adjust to the optimal level through only cash flow from operation ignoring other two components of cash flow statements – the cash from financing and cash from investing activities. We argue that firm and institutional dynamics are dissimilar (like underdeveloped financial markets, weak corporate board efficiency, ownership pattern) in emerging markets compared to developed markets and therefore, the adjustment mechanism may be different. We further conjecture that besides financial development and accessibility of fund, the cash holdings decision of the firms in emerging countries may also get affected by the extent of development of equity markets, effectiveness of the corporate boards and a firm's spending on R&D. Therefore, we study the impact of these institutional variables, on the dynamics of cash holdings and adjustment mechanisms of seven emerging Asian countries. Our aim is to understand how the business environment of a country has an impact on cash management policies of the firms and to investigate if there is any asymmetry in cash adjustment dynamics when a firm deviate from its long- term target of cash holdings.

Using 11, 407 firms with 125,414 firm year observations from seven Asian countries, we employ the partial adjustment model to understand the speeds of adjustment whenever there is a deviation from the target cash level and extend the arguments of prior authors (Gao *et.al.*, 2013; Orlova and Rao, 2018; Jiang and Lie, 2013) regarding the cash holdings adjustment behaviour of firms. We

also use models suggested by Nguyen (2019) to study the impact of country variables on the dynamics of cash holdings and adjustment mechanism. We find that financial development, financing through local equity market, firm's spending on R&D and board efficiency have positive and significant effect on corporate cash holdings. This indicates that the business environment of a country has a significant impact on cash holdings. Further, we also find evidence that firms with excess and deficit cash holdings follow a pecking order while adjusting the cash level to the optimum.

Our study differs from the earlier studies in several aspects. First, we consider five variables (financial development, ease of access to loans, raising capital through equity markets, board efficacy and firm's spending on R&D) to assess their impact on firms' cash holdings policies, whereas prior literature (Khurana et al., 2006) considered only financial development ignoring the other variables. The main contribution of our paper to the existing literature is that we consider factors measured at the country level, whereas extant literature explores these dynamics considering firm level factors. Second, we investigate the role these variables play on the dynamic aspect of corporate cash holdings by measuring the *speed of adjustment* following suggestion of Almeida et.al. (2004) in emerging countries context whereas prior studies (Orlova and Rao, 2018; Bates et al., 2017) consider developed country context. It provides insights into the cash management policies of firms in emerging Asia where the business environment, institutional set up are quite distinct from developed markets as well as from emerging markets of other parts of the world. Third, prior literature on dynamic cash holdings assumes single mechanism of adjustment to target level using cash flow from operation, mostly ignoring other two components of cash flow statements – the cash from financing and cash from investing activities. This is partly addressed by Nguyen (2019) but

the paper considers only firm specific variables and uses sample of firms in G5 countries only. We use different mechanism, country level variables and sample from emerging countries. Fourth, we further explore how firms adjust their excess and deficit cash holdings when the institutional variables are controlled for. We extend the literature by providing new evidence that there is asymmetry in cash adjustment dynamics of firms after controlling for the overall financial development of a country. Finally, we study the cash dynamics in emerging Asia which is an important geographical region from the perspective of its contribution to the world GDP and trade. This part of the world dominated by India and China[3] accounts for about 2/3rd of the current global growth of the world. Mann and Jha (2019)[4] predict that the growth rate of the world will be about 3.4% but excluding emerging Asia, it will be only 1.1%. Under these circumstances, the financial management policies especially cash management of the firms in these countries are expected to be different from those in the developed markets.

The results of the study are helpful to corporate managers as these are important references to them to understand and design cash management policies by considering factors that are measured at the country level. It also provides them a clearer understanding about the role of corporate board and information asymmetry in cash holdings. To the best of our knowledge, ours is the first study which examines the role of country specific variables on corporate cash holdings and their adjustment mechanism of firms in emerging Asia.

[3] which are ranked 2nd and 5th respectively in the world in terms of size of the economy.

[4] Mann and Jha (2019). Emerging Asia is the present and future for growth. *Standard Chartered Bank*, August. *https://www.sc.com/en/trade-beyond-borders/emerging-asia-is-the-present-and-future-for-growth/* (accessed January 27, 2020)

The remaining paper is organized as follows. In section 2, we review the extant literature and develop hypotheses. Section 3 gives details of the sample and outlines the methodology. In section 4, we present and discuss the empirical results, in section 5 we report robustness results, section 6 concludes the study and finally in section 7 we outline the managerial implications of the study.

2. Literature review and hypothesis development

2.1 Cash management policies

Keynes (1936) in his theory of employment, interest and money, suggests that firms have precautionary motive for cash holdings. He proposes that the major advantage of maintaining cash is that it allows the firms to undertake positive NPV projects when they arise. He further argues that the cash maintained by the firm is also influenced by the extent to which the firms have access to capital markets. Baumol (1952) and Miller and Orr (1966) formulated a theory for cash holdings based on the inventory management model. They assume that firms have a target cash level and when they deviate from the target, the cash holdings are adjusted instantaneously. The assumption which is implicit in their theory is the existence of frictionless or perfect capital market in which firms can raise funds when the cash holdings are less than the target and invest when it exceeds. In other words, in a perfect market, it is irrelevant to maintain cash. In the presence of market imperfections, however, it matters and there is a trade-off between cost and benefit of holding cash (Jensen and Meckling, 1976; Myers and Majluf, 1984; Jensen, 1986). The trade-off theory of cash holdings suggests that firms maximize the shareholder's value by holding cash if the marginal cost of holding an extra dollar of cash equals the marginal cost of raising it. By maintaining enough

liquidity to fund new projects and to sustain working capital requirements, managers avoid the monitoring and scrutiny of outside stakeholders.

Prior studies (Dittmar et al.,2003; Kalcheva and Lins, 2007; Kusandi and Wei, 2011) also indicate that due to agency costs managers' and shareholders' view towards the corporate cash holdings varies. Opler et al. (1999) argue that managers prefer excess liquidity as it reduces the firm risk and increase their discretion. However, in a study of the European Market Union countries, Ferreira and Vilela (2004) do not find any evidence that agency conflicts between the shareholders and managers play a determining role in the cash management policies of the firms.

Subsequently, researchers identify some other non-financial determinants of cash holdings. For instance, some of the studies highlighted the importance of investors protection and legal system as a determinant factor in cash holding i.e. Dittmar *et.al.* (2003) in a cross-country analysis, find that information asymmetry and future growth become less important for cash holdings when investor protection regulations are low. Similar results are reported by Pinkowitz *et.al.* (2006) in which they find that the relation between cash and firm value is weaker in countries with weak investor protection. Similarly, Kalcheva and Lins (2007), Dittmar *et.al.* (2003), Harford *et.al.* (2008) analyze the impact of cash holding on firm's value and find that when shareholder protection is low, firms have lower values if the controlling managers hold more cash.

Similarly, some others non-financial determinants of cash holdings include anti-takeover strategy (Faleye, 2004), tax savings considerations (Foley *et.al.*, 2007), real activities management (Greiner, 2017) and corporate ownership (Anderson and Hamadi, 2016; Dittmar *et.al.*, 2003; Mikkelson and

Partch, 2003). Although there are evidences of the impact of financial and non-financial variables (positive or negative) on corporate cash holdings, we argue that the impact will be different across developed and emerging countries.

Institutional variables and cash holdings

Although the extant literature has investigated the role of institutional variables like corporate governance and firm ownership in the corporate liquidity decisions, these variables are broadly measured at the firm level. Very limited studies measure these variables at the country level. Available literature documents the effect of firm or industry level factors on corporate cash holdings, but we argue that country level factors may also affect cash holdings decisions. For example, Orlova and Sun (2018) find that corporate governance and investors protection have a significant influence on speed of cash adjustments. Similarly, the general business environment of a country in which a firm operates affects corporate decisions. For instance, in a country which has less developed financial markets or high political and economic uncertainty, firms are expected to hold more cash or vice versa (Huang et al.). Some other studies which investigate the effect of country level variables on corporate financial decision consider the multiple factors i.e. economic development (Lucas, 1988; Kevin and Levine, 1993), legal and financial system (Demirguc and Maksimovic, 1998), financial sector development (Rajan and Zingales, 1998) and demand for liquidity (Khurana et al., 2006). Rajan and Zingales (1998) argue that the financial development of a country helps a firm reduce problems of moral hazard and adverse selection. Khurana et.al. (2006) examine the impact of financial development of a country in the sensitivity of corporate cash holdings. They find that the sensitivity of cash to cash-flows decreases with financial development. Extending the work of Khurana et.al. (2006), Kusandi and Wei (2011) investigate the cash management policies in a sample

of 39 countries by considering legal protection to shareholders, financial development of a country and financial constraints of a firm. They report that there is no first order effect of financial development on the sensitivity of cash to cash-flows. They also argue that firms in a country which has strong shareholder protection legal system in place in contrast to financial development, face less hurdles in raising cash and thereby maintain less cash. In another study, Fresard (2010) consider the relationship between product market condition and cash holdings and finds that cash holdings are valuable for those firms which are operating in product market conditions. In summary, prior studies suggest that the institutional factors other than corporate governance and investors protection significantly affect cash holdings, although the results in some cases are still inconclusive.

Further, it is also established that an efficient and effective corporate governance mechanism also affects corporate cash holdings. For instance, Pinkowitz et.al. (2006) and Almeida et.al. (2011) find that firms with efficient corporate governance hold less cash. Consequently, a country with high financial development helps the firms to reduce the cost of funds by providing a well-functioning debt and equity market. Emerging countries have less developed financial market as compared to developed countries both in the equity and debt segments. Therefore, we postulate that the impact of institutional variables at the country level is expected to be significant and different as compared to developed markets.

In this paper, we consider five variables measured at the country level as defined by the World Bank – financial development, ease of access to loans, firm spending on R&D, board efficacy and financing through equity. These variables indicate the overall business and economic environment. Although financial development and its impact on corporate cash holdings has been studies by

Khurana et al. (2006), the other variables received no attention. We further postulate that a country's business and economic environment affects corporate decision making. For instance, ease of accessibility to bank loans, well developed equity markets may induce lower cash holdings by firm's ceteris paribus. Thus, in present study we include financial development, ease of access to loan and easy of raising cash through equity marks as independent variables.

Prior studies which measure the impact of R&D on corporate cash holdings have focused on the R&D spending by individual firms (Brown and Petersen, 2011). This approach may lead to biased results especially if in a country only handful of industries like pharma, automobiles, IT enabled services etc. spend heavily on R&D and within an industry there may be few firms doing so. Therefore, impact of R&D on cash holding varies country to country. To capture this differential impact, we introduced country level R&D as an independent variable in our study. Chen et al. (2014), find that a good corporate governance lowers the investment sensitivity to cash flows and cash sensitivity to cash flows. This in turn decreases cash holdings more significantly in private firms and improves access to bank and trade credit financing. It is therefore important for an investor to know the overall business environment of a country before making any investments. A conducive business environment supported by government policies may facilitate such investments. In other words, a country with good R&D environment, well defined corporate governance policies, and a well-developed financial market for easy accessibility of funds may lead to lower cash holdings. We do not predict any direction (positive or negative) of the impact of our variables on cash holdings because variables such as ease of access to loans, firm spending on R&D, board efficacy and financing through equity were not used in prior studies. Moreover, prior literature also inconclusive

about the impact of the institutional variables. Based on the above discussion we formulate our first hypothesis.

H1: After controlling for firm specific financial variables, institutional variables have significant impact on cash holdings.

2.2 *Dynamics of Cash holdings adjustment*

In the presence of market imperfections, there are many factors that affect corporate cash holdings and its adjustment dynamics. In the *static model* of cash adjustment, Miller and Orr (1966) propose that there is an immediate adjustment of cash to the target level as and when it deviates from it. In the *dynamic model*, (Gao et. al., 2013; Orlova and Rao, 2018; Kusandi and Wei, 2011; Bates et.al. 2018; Jiang and Lie, 2016), there is a time lag between the time when the cash deviates from the target and the time by which it converges to the target and this time lag is measured by the speed of adjustment. For example, Orlova and Rao (2018) find that mature firms have slower speed of adjustment than newer firms and firms with high free cash flow have a faster adjustment rate. Bates et.al. (2018) report that in the presence of market frictions, the speed of cash adjustments is slower in financially constrained firms. Although these studies establish that firms indeed adjust cash depending on factors ranging from cost and benefit of cash adjustments, managerial entrenchments, firm age, extent of development of financial market and ability of firms to access capital market but they do not illustrate how firms adjust to their targets. In a recent study, Nguyen (2019) demonstrates that there is asymmetry in firms' adjustment mechanisms to the target and all firms adjust to the optimum level using cash from operations, cash from investments or cash from financing activities. He also reports that firms with excess cash adjust to the optimum level using the cash from financing activities while firms with deficit cash adjusts via the cash from financing

activities. This indicates that firms follow a pecking order while adjusting cash depending on the sign of deviation from the target.

Contemporary research extends the scope by including factors other than firm specific financial variables which explains the cash holding decisions of firms. Consequently, efforts have been made to understand the other determinants of corporate cash holdings in an ever-changing business environment. In one of such studies, Faulkender and Wang (2006) argue that managers can increase the value of the firm by maintaining a liquidity buffer and this value is increased when the internal resources are insufficient to fund any capital expenses. In another interesting study, Jiang and Lie (2016) find that managerial vested interest affects the cash holdings of a firm. Further, Kalcheva and Lins (2007), consider corporate governance, Duran et.al. (2016) use family ownership, Kusandi and Wei (2011) consider legal protection to shareholders to study the impact on corporate cash holdings decision. Collectively, these studies suggest that a firm's cash holdings change depends upon changes in firm specific non-financial variables as well.

Subsequent studies extend these arguments to explain the phenomenon, when a firm deviate from the long-term target, how fast they converge to the original target, which is measured by the speed of adjustment of cash. This stream of research includes study by Dittmar and Duchin (2011), Gao *et.al.* (2013), Orlova and Rao (2018). In a study of cash management policies in US public and private firms, Gao et.al. (2013) find that the speed of adjustment of cash towards the target is slower in public firms as compared to the private firms. Studies on dynamic aspect of cash holdings have assumed that given a deviation from the target, firms adjust cash to the target or optimum level using cash from operations (CFO). However, Nuygen (2019) provide evidence that firms adopt

different approaches while adjusting to the target cash levels. He argues that when the firms have excess cash holdings, they converge to the target cash level using cash from financing activities, while firms having cash holdings below the target level use cash from operations to adjust their cash holdings. We further argue that the adjustment mechanism for firms with deficit and excess cash holdings in countries which have underdeveloped financial market is different. For instance, when the firm in a country with less developed financial market has deficit cash then the adjustment through financing activities will be restricted and the firm has to search for alternative way to raise funds. Similarly, if a firm in a country with low score on R&D environment has excess funds, then investing in value generating activities will get affected. Therefore, it is important to understand how the cash adjustment dynamics are affected by these institutional variables. Based on the discussion we propose our second hypothesis:

H2a: Firms follow a pecking order for adjustment of cash holdings in the presence of country level variables.

Further, prior studies indicate that the country level factors are important determinants of corporate cash holdings too (Rajan and Zingales, 1998; Kusandi and Wei, 2011; Khurana et.al.2006). The overall business environment of a country can also affect the ways by which firms adjust cash holdings. For instance, countries where the financial market are well developed and firms have easy access to funds, the cash adjustment mechanism may be different from those countries with less developed financial markets. An easy availability of funds may tempt the firms with excess cash holdings to reduce it to the optimal level using cash from operations and any immediate requirement of funds for investment may be generated from the market. Similarly, firms with deficit cash holdings can meet the fund requirements by raising funds from the financial market either through equity, debt or bank loans.

H2b: After controlling for firm specific financial variables, country specific variables positively affect cash adjustment mechanism.

3. Methods

3.1 Sample

Our final sample considers 11, 407 firms with 125,414 firm year observations from 7 countries. We started by considering 9 countries in emerging Asia according to the Morgan Stanley Capital International Emerging Market Classification, 2019 (MSCI). These include China, India, Malaysia, Philippines, South Korea, Pakistan and Indonesia, Thailand and Taiwan. MSCI classifies these countries as emerging Asia based on certain economic and market-based criteria. For example, the price to earnings (PE ratio) of these countries have consistently outperformed the emerging market (EM) index. Further, the yield, momentum, volatility factors in these countries are found to have similar impact on risk and return to equity of assets. The economic expansion in these regions especially Southeast Asia, India and China has been robust despite external and domestic headwinds (OECD, 2019)[5]. The GDP growth rate in these countries have also been similar especially in the last 5 years with an average of 6.8%. That make us to believe the similarity in the economic and business environment of these countries.

We extract financial variables from S&P Capital IQ Database and the country specific variables from the World Bank database 2019. Due to the availability of data only from 2007 in the World Bank database, our sample period is restricted from 2007 to 2019. During this period, the country specific data are not available for Thailand and Taiwan. Therefore, we exclude Thailand and Taiwan from our sample and focus on the remaining 7 countries. Following extant literature, we

[5] OECD (2019), Economic Outlook For Southeast Asia, China And India 2019: Towards Smart Urban Transportation

exclude financial services and utility firms as they operate under regulated environment. Further, we remove the year for which any observation of financial variable is missing making our sample an unbalanced panel. We winsorize all the continuous financial variables at 5% on both the tails to reduce the impact of outliers. Table 1 provides the country-wise break-up of the sample.

3.2 Variable definition

Following Kalcheva and Lins (2007), we measure cash holdings as cash/ TA, where TA is Total Assets *less* cash and cash equivalents, Div (dummy) 1 for paid, 0 otherwise; Size is measured as natural logarithm of total assets, Capex is the capital expenditure as a percentage of total assets, CFO for profitability, leverage is measured as total debt deflated by total assets, and net working capital (NWC) is measured as change in current assets *less* change in current liabilities between time *t* and *t+1*. We consider five country level variables – Financial development (FD) defined as the combination of four proxy variables related to the financial institutions and financial markets – depth, access, efficiency and stability, Ease of access to loans (Ease) defined by accessibility to bank loans, Financing through equity (Fin_equity) defined as ease of raising capital through equity, company spending on R&D (R&D) defined as the extent of spending on R&D and Efficacy of corporate boards (Efficacy) measured as accountability of management to the investors. All these variables are provided by *World Competiveness Report* issued by the World Bank. They are measured as scores obtained by each country on a scale of 1(lowest) to 7 (highest). Out of the five country specific variables, *Efficacy* and *R&D* indicate the overall board activism and R&D quality existing within a given country. The remaining three *FD, Fin_equity* and *Ease* as indicators of market development of a country and therefore are systemic in nature.

3.3 Models

The speed of adjustment mechanism has been extensively studied in the past with respect to dividends and capital structure (Chang and Dasgupta, 2009; Lintner, 1956; Lambrecht and Myers, 2012; Byuon, 2008). These studies use the partial adjustment model to understand the speeds of adjustment whenever there is a deviation from the target. Although, Miller and Orr (1966) propose a dynamic cash adjustment model, their study assume an instantaneous adjustment to the cash holdings in case of deviation. Later studies refined the argument in the model to include a lag in the adjustment (Dittmar and Duchin, 2011; Gao *et.al.*, (2013); Orlova and Rao, 2018; Jiang and Lie, 2013, Almeida et.al., 2004, Kusandi and Wei, 2011) and they suggest that due to the presence of market imperfections, the adjustment to the cash is not instantaneous and there is a time lag for the adjustment. We extend the arguments of these papers to study the cash holdings adjustment behaviour of firms when country specific variables are considered.

We follow the models suggested in Kusandi and Wei (2011) and Nguyen (2019) to study the impact of country variables on the dynamics of cash holdings and adjustment mechanism. Accordingly, we use one lag of the dependent variable and estimate the first pass regression model to estimate the optimum cash level (or target cash) of a firm at a given year and we call it as $Cash_{it}^{target}$:

$$Cash_{it}^{target} = \alpha_i + \gamma_t + \pi_c + \beta' X + \nu_{it} \quad (1)$$

Where, α_i are the firm's specific characters which remain constant across firms, γ_t are the time fixed effect, β' is the vector of parameters to be estimated, π_c are the country fixed effects and X is the vector of firm specific variables – capital expenditure (Capex), cash from operations (CFO), dividend paid (Div), net working capital (NWC), gross plant, property and equipment (PPE), firm

size (Size) and total debt (Debt). and v_{it} is the error term. We estimate equation (1) using fixed effect method.

Then following the partial adjustment model of Dittmar and Duchin (2010), we estimate the cash adjustment model as specified below:

$$Cash_{it} - Cash_{it-1} = \lambda \left(Cash_{it}^{target} - Cash_{it-1}\right) + \varepsilon_{it} \quad (2)$$

Where, $Cash_{it}$ is measured as Cash and cash equivalents as a percentage of non-cash total assets, λ is the speed of adjustment and $Cash_{it}^{target}$ is the target cash ratio of the firm estimated from the first stage regression.

Substituting (2) in (1) and after simplification, we get,

$$Cash_{it} = (1 - \lambda)(Cash_{it-1}) + \lambda\alpha X_{it} + v_{it} \quad (3)$$

The above model is estimated using the System-Generalized Method of Moments (Sys-GMM) method suggested by Blundell and Bond (1998). In the partial adjustment model of cash holding, the cash holding of the firm (i) at a particular point of time, t ($Cash_{i,t}$) depends, inter alia, on its past cash holding ($Cash_{i,t-1}$). Therefore, the estimated panel regression model (Equation 4) is dynamic in nature and has a lagged dependent variable as one of the regressors. Nickell (1981) notes that the usual fixed effects estimators (such as the first-difference estimator) are inconsistent for estimating a dynamic panel data model with lagged dependent variable as a regressor. Because of the peculiar lag structure of the model, the error term is correlated with the lagged dependent variable and create the problem of endogeneity. To overcome this problem, Anderson and Hsiao (1981) propose the instrument variable (IV) method, which uses the deeper lags ($\Delta y_{i,t-2,}$ $\Delta y_{i,t-3\ldots,}$) as instruments for the first lag of differenced dependent variable ($\Delta y_{i,t-1}$). Arellano and Bond (1991)[6] suggest a GMM based approach (known as difference-GMM) for estimating the dynamic panel regressions, which uses the deeper lags of level observations (($y_{i,t-2,}$ $y_{i,t-3\ldots,}$)) as instruments for $\Delta y_{i,t-1}$ for orthogonality conditions. These approaches, though consistent, fails to take all of the potential orthogonality conditions into account. Blundell and Bond (1998) propose the System-GMM to deal with this problem. In addition to Arellano and Bond type orthogonality

conditions (E[$y_{i,t-\tau}\Delta u_{i,t}$]=0, for t ≥3 and $\tau \geq 2$), it uses additional orthogonality conditions - E[$\Delta y_{i,t-\tau}, (\alpha_i + u_{i,t})$]=0, for t ≥3 and $\tau \geq 2$. Therefore, System GMM uses deeper lags of level observations and the first lag of differenced dependent variable as instrumental variables.

We have used system GMM approach for estimation of the model and accordingly the level of cash balance ($Cash_{i,t-\tau}$) and change in cash balance ($\Delta Cash_{i,t-\tau}$), second and third lags of dividend, cash from operations, net working capital, plant, property and equipment, total debt and capital expenditure have been used as instrumental variables. When the number of time series observations are relatively large, the number of instruments grow quite high. The distinct lagged values may not be correlated with the present observations of dependent variable or its first difference. Therefore, these deeper lagged values are only week instruments which negatively impacts the efficiency of GMM estimation. Therefore, we have used the maximum lags up to three ($2 \leq \tau \leq 3$).

One of the important assumptions for validity of using the deeper lagged values of dependent variable at level and the first difference in GMM estimation, is that the error term ($u_{i,t}$) is independently and identically distributed. A serial correlation in error term will make these instruments invalid. The first difference estimator mechanically introduces a serial correlation of first-order (AR(1)) in $\Delta u_{i,t}$. However, there should be no second-order (AR(2)) or higher order serial correlation in error term. We conduct, Arellano-Bond test for autocorrelation of the first-differenced residuals. The results do not reject the null-hypothesis of the absence of second-order autocorrelation on $\Delta u_{i,t}$. This supports the validity of instruments used.

We also use the Sargan–Hansen (J) test for evaluation of over-identifying restrictions. The results (reported in Table 3, Panel A) show that the null hypothesis that the overidentifying restrictions are valid cannot be rejected.

One problem that may arise while using the model in equation 3 is the "generated" regressor problem (Petersen, 2009). The Target cash estimated from equation (1) is a key input variable in equation (3 and subsequently in 4). To estimate target cash, equation (1) was first estimated and used. When target cash is used as a regressor in equation (4), this regressor is a "generated" one subject to estimation or statistical error from equation (1). One way to deal with this problem is to estimate the equation 3 for various subsamples (see Venkiteshwaran, 2012). But, Faulkender et al.

(2012) suggest estimating equation 3 (equation 4 is its extension) separately for subsamples may produce misleading results mainly because multiple estimations of equation (3) for different subsamples would fail to impose a consistent model of target cash holdings across the specifications. Accordingly, they suggest using a two-step system generalized method of moments estimator (Blundell & Bond, 1998). Therefore, in our paper, we follow this methodology to deal with the problem of generated regressor error.

Using the model as specified in (2) above and following the methodology suggested in Jiang and Lie (2016), we then estimate the following model to study the impact of country specific and other variables on the cash adjustment dynamics:

$$Cash_{it} - Cash_{it-1} = \lambda \left(Cash_{it}^{target} - Cash_{it-1}\right) + \varphi\left(Cash_{it}^{target} - Cash_{it-1}\right) \times countryspecific + \nu_{it} \qquad (4)$$

Where country specific variables include three systemic variables – financial development, ease of access to loans and financing through equity market and two firm specific variables – R&D spending and board efficiency.

4. Results

4.1 Country wise descriptive statistics

The median values of all the variables are presented in Table 1. The country specific variables are the scores measured on a scale of 1 to 7, with 1 being the lowest and 7 being the highest score of a country. We find lot of similarities in the variables as they all belong to the emerging market. Cash holdings varies between 1.5% of total assets in Pakistan to 15.1% of total assets in China. The debt to total assets ratio is the highest in India with about 32% of total assets signifying that firms in India

are highly levered. This contrasts with that in Pakistan where the firms are levered as much but their capital expenditure is considerably less than India. Among the country specific variables, Malaysia fares best among all sample countries. The board efficiency (Efficacy) score of Malaysia is 5.34 (highest) and the that of Pakistan is 4.06 (lowest). Their corresponding cash holdings are 5.6% and 1.5% indicating that corporate boards may have a significant influence on corporate cash holdings. The firm spending on R&D is high in Malaysia, South Korea and China. Following Dittmar et.al. (2003) who consider a firm's spending on R&D as a measure of information asymmetry, this indicates a high degree of information asymmetry in Malaysia followed by South Korea and China.

[*Table 1: Panel A here*]

The Pearson's correlation matrix is shown in Table 1, Panel B. To avoid possible multicollinearity in our models we include the institutional variables in each model in a mutually exclusive basis meaning that one institutional variable has been included in our model at a time. Accordingly, even if the correlation among the institutional variables is high, they will not affect our results (Blanchard, 1967; Gujarati et al., 2021). We also calculate variance inflation factors (VIF) for each independent variable (table provided in Appendix) which indicates that all independent variables except Ease and R&D are within the conservative threshold of 5. To deal with the problem of Ease and R&D we re-run the regression using centred variable approach in which we demean all the explanatory variables. This standardisation does not change the economic interpretation of the variables even if the numeric values of the coefficients may change. Cash holdings is positively and significantly related to efficacy and R&D spending. This means that firms in the countries in which the spending on R&D is amicable hold more cash. This is intuitively true as firms invest in innovation through R&D on a continuous basis and in order to meet the expenses hold more cash. Further, board efficacy is also positively and significantly related to cash holdings. This indicates precautionary motive of firms in the emerging

Asian countries. Kusandi and Wei (2011) find that firms in countries with low investor's protection and weak legal system hold more cash. Countries in our sample are known to suffer from both (Thakur and Kannadhasan, 2019). This necessitates firms to hold more cash despite these countries with high board efficacy. On the other hand, cash holding is negatively and significantly related to financing through equity, financial development and ease of access to loans. This is in line with the argument that a country in which firms have easy access to funds either through banking channel or through the capital market hold less cash.

[*Table 1: Panel B here*]

The results of the first stage regression are presented in Table 2 (equation 1) in which we consider the firm specific variables which affect cash holdings. All the coefficients have expected sign and are significant at 1%. Firms with more investment opportunities hold more cash which is proxied by the capital expenditure (capex). Net working capital is considered as a substitute for cash as they are expected to be converted into cash in one operating cycle. Therefore, firms with high net working capital hold less cash. Similarly, asset tangibility (PPE) means the holding of tangible fixed assets like plant, land and buildings and property by the firm, which can be converted into cash when need arises even though the cash conversion time is longer as compared to working capital. Size is measured as natural logarithm of total non-cash assets and is included in the regression to understand if firms size has any impact on cash holdings. We find that firm size and cash holdings are negatively related. The results are consistent with prior studies (see Opler at al., 1999; Harford, 1999; Faulkender and Wang, 2006; Faleye, 2004). The results of the first stage regression are used to estimate the optimum or target cash level of a firm which we use in the subsequent models.

[Insert *Table 2 here*]

4.2 Empirical Results

4.2.1 Target adjustment mechanism (H1)

In Table 3, Panel A (equation 4), we present the results of cash adjustment dynamics of firms. The coefficient λ indicates the speed of adjustment of cash if it exceeds or falls short of the target $Cash_{it}^{target}$. To this preliminary partial cash adjustment model of Dittmar and Duchin (2011), we add the country specific variables separately. To understand the impact of these variables on the speed of adjustment, we code them as 1 if the score is more than the median and 0 otherwise. In Model 1, we include financial development (FD) and see that firms in countries with high FD score have a higher speed of cash adjustment of about 0.365 (0.342 + 0.023). That may be due to easy availability of capital as and when required. Therefore, firms operating in a financial well-developed system do not hold excess cash and adjust it to the target promptly. This happens since firms in well developed markets can raise capital as and when required and hence, they do not need to hold more cash. Consequently, any negative deviation (excess cash) is quickly adjusted towards the target. Similarly, any positive deviation (deficit cash) is also quickly adjusted as the raising fresh capital may be costly and sometimes value reducing proposition. Our results are consistent with Kusandi and Wei (2011). In Model (2), we find that the coefficient on *Ease* is negative and significant. It indicates that when firms adjust to the target at a slower rate when they hold excess cash as compared to when they hold deficit cash. This explains that when firms have deficit cash, their cash holdings increase at a faster speed when they have easy accessibility to loans.

In Model 3, we include board efficacy. We see that on an average, firms in the countries which score high on-board efficacy parameter have a faster speed of adjustment as compared to those firms where board efficacy scores less. This indicates that firms in countries with high board

efficiency have an optimal cash management policy and any deviation is addressed by the quick intervention of the board. Our results are consistent with the corporate governance mechanism at the firm level studies of Dittmat et.al. (2003), Pinkowitz et.al. (2006); Klapper and Love (2004).

In order to test the effect of a firm's access to capital through the equity market on the speed of adjustment, we include *Fin_equity* in our regression (Model 4). We use the sys-GMM method suggested by Blundell and Bond (1998) to estimate our models. In this model, we use the first lag of cash and the contemporary values of dividend, cash from operations, net working capital, plant, property and equipment, debt and capital expenditure as instruments. We then perform the instrument validity test using the Sargan test. The results of instrument validity test indicate that all the variables are valid (Table 3, Panel A).

We find a positive and significant coefficient on the *Fin_equity* indicating that when a firm holds excess cash in the country with well-developed equity market, the speed of adjustment is faster. This is because firms can raise capital through issuing equities whenever they require capital so there is no need to hold excess cash. This further explains that managers in a country with well-developed equity market may not hold excess cash to reduce the agency cost and information asymmetry. We also report the results of Arellano-Bond test. The error terms do not exhibit either first or second order autocorrelation.

[*Table 3 Panel A here*]

In order to assess the impact of the institutional variables on cash change, we now include these variables in a single regression. The results (Appendix II) provide some interesting insights. We see that although there is no change in the signs of the coefficients, the statistical significance has changed for Fin_equity and efficacy when they are interacted with target cash. This provides

evidence that financial development, ease of access to loans and the R&D spend by firms are sufficient to explain the changes in cash.

Dittmar et.al. (2003) consider a firm's spending on R&D as a measure of information asymmetry and they find that firms with high R&D expense (also high information asymmetry) tend to hold more cash. We extend their argument to understand the impact of R&D expenses (Model 5) on cash adjustment speed and find that on an average, the speed of adjustment is less in the firms with high R&D expenses. We further substantiate this finding by regressing change in cash holdings between t and t+1 on R&D expense and find (unreported, but available on request) that R&D expense is significant and positive. Since we consider R&D expense as a measure of information asymmetry, the result indicates that as the score of a firm's spending on R&D increase in a country *i*, between year *t* and *t+1*, the cash holdings of firms operating in that country also increase signifying that as the information asymmetry increase, the change in cash holdings also increase. Our finding is consistent with Dittmar et.al. (2003). Further, the negative and statistically significant coefficient on the interaction of R&D expense and speed of cash adjustment indicate that the firms in those countries where R&D is high reducing the information asymmetry by not immediately converging to the target cash level. We now investigate the hypothesis that firms follow a pecking order while they adjust cash holdings to the optimal level. The results are discussed in Panel B of Table 3. In first (second) column we report the results of the speed and mechanism of adjustment when a firm holds excess (deficit) cash. We find that after controlling for country specific variables, the speed of adjustment is faster when the firm holds excess cash. However, firm choses different mechanisms while adjusting the cash to the target. The speed of adjustment via the cash from investing activities when a firm holds excess cash is 0.331 (0.268 +

0.068) followed by adjustment through cash from operations (0.281) and cash from financing activities (0.259). It indicates that when firms have excess cash, they increase the investing activities (investment in capital assets, acquisitions) which may increase the shareholder's value. This is followed by investment in operating activities like investments in working capital, extending credit periods to customers. The negative coefficient on cash from financing activities indicate that when firms have excess cash, they prefer to disgorge the cash by repayment of loans, repurchase of shares or retiring the debts. In the pecking order, when a firm holds excess cash, the adjustment mechanism is carried out by cash from investment activities followed by cash from operations and cash from financing activities in that order. On the other hand, when the firm holds deficit cash (Column 2), the adjustment is done via the cash from financing activities followed by cash from operating and cash from investment activities. This indicates that in case of deficit cash holdings, firms issue debt or equity or take loans from banks and financial institutions. This is followed by funding of the deficit using the operating activities and firms may reduce investments in working capital or expedite credit collections from customers. Therefore, firms follow a pecking order to reduce the deficit cash holdings by using financing activities followed by operating and investment activities.

[*Table 3 Panel B here*]

4.2.2 Cash holdings and adjustment dynamics (H2)

In order to test our hypothesis that country specific factors have impact on cash holdings and cash adjustment dynamics, we perform two separate regressions. The results are reported in Table 4. In Panel A, we use panel data method and cash is regressed on country specific factors as well as firm specific variables. We see that except ease of access to loans, all other country specific factors

have positive and significant impact on cash holdings. The *variables FD, Fin_equity and R&D* are significant at 1% level and *efficacy* is significant at 5%. Financial development of a country is the most important systemic variable that affects the corporate cash holdings. The coefficient on FD is 0.0036 which is statistically significant at 1%, and we may interpret it as firms cash holdings increase (decrease) by 0.36% for every 1unit increase (decrease) in FD score. With an average total asset of $74 million, this translates to about $0.27 million. It indicates that when the financial development of a country is high, firms hold more cash in anticipation of future growth opportunities. Similarly, the coefficient on *Ease* is 0.0001 which is statistically significant at 1%, which means that a firm's cash holdings increase (decrease) by 0.01% for every 1 unit increase (decrease) in *Ease* score. The coefficient on *Fin_equity* is 0.0002 which is statistically significant at 1%, we may interpret it as firms cash holdings increase (decrease) by 0.02% for every 1unit increase (decrease) in *Fin_equity* score which is about $0.0148 million. The coefficients on *R&D* and *Efficacy are* 0.0003 which is statistically significant at 1%, suggest that an average firm's cash holdings increase (decrease) by 0.03% for every 1 unit increase (decrease) in *R&D* and *Efficacy* scores and this translates to about $0.022 million. Therefore, we find that an average firm in these countries are affected by institutional variables economically significant ways with various intensity. Out of all institutional variables the *FD* affecting cash holdings the most. The results are consistent with Khurana et.al. (2006). The coefficient on R&D is also positive and significant. Following Dittmar et.al. (2003), we have considered R&D as a measure of information asymmetry. It indicates that after controlling for capex (a proxy for growth), as the expenses on R&D increases, managers endeavor to reduce the information asymmetry by holding more cash.

[*Table 4 Panel A here*]

In Table 4 Panel B, we present the results of cash adjustment mechanisms when firm specific and systemic variables are considered separately. As the results show, the country specific variables do not have significant effect on cash adjustment dynamics of firms in which the speed of adjustment of cash is about 37%. But the contribution of board efficacy is accentuated when the country specific variables – FD, Ease and Fin_equity are controlled for in separate regressions. We find that countries where FD score high tends to have a dominant role of the corporate boards in adjusting the cash levels. The coefficient on efficacy is 0.107 and is found to be statistically significant (Column 1). In other words, the speed of adjustment in cash in those countries having high scores on financial development is about 0.477 (0.37 + 0.107) as compared to about 0.377 in countries with high scores on ease of access to loans and financing through equity parameters.

[*Table 4 Panel B here*]

Ease of access to loans and financing through equity affect the cash holdings adjustment mechanics in a similar way (column 2 and 3). This probably happens as both these factors are supplement to each other and firms in the countries with high scores on ease of access to loans and financing through equity can raise capital either through loans or issuing equity.

5. Robustness

One major concern in econometric analysis is the possibility of inconsistent and inefficient parameters when the variables are scaled using different techniques. In corporate finance, the most commonly used deflator is total assets. Although we use total assets as deflator in all our regressions, we check if there is any impact on results when the variables are deflated using a different deflator. We consider total sales as the deflator for the first pass regression in equation 1 (we do not report the results in the paper in order to save space but are available on request). The choice of total sales

is motivated by some studies in the past (Ravenscraft and Scherer, 1982; Hafzalla et al., 2011). We find that although the coefficients are different numerically, but they do not change economically and statistically).

[*Table 5 Panel A here*]

Past studies indicate that investor's protection plays a crucial role in corporate finance decisions (Kusandi and Wei, 2011; La Porta et al., 1997, Pinkowitz et al., 2006, Kalcheva and Lins, 2007). These studies specify that firms in countries with high investor protection are likely to hold less cash. We argue that the impact of investor protection on corporate finance decisions and more specifically cash management decisions needs to be assessed considering the financial development of a country, the efficacy of corporate governance, access to capital markets and spending on R&D. For example, a country with high investor protection but less financially developed markets are likely to hold more cash. In order to examine the impact of investor protection of a country on a firm's cash holdings, we extend our main regression equation 4 to include investor protection in a country. We collect the scores on investor protection from World Bank database which is on a scale of 1 to 10 with countries with a score of 1 have least investors protection and 10 with the strongest. We present the results in Table 5, Panel A. The results indicate that investors protection has a negative but statistically significant impact on cash holdings. Qualitatively the results remain same as original results presented in Table 3 (Panel A). By including the investor protection scores, we also find that the adjusted R^2 values have substantially increased in all the models. However, the coefficients on investor protection is not statistically significant when the scores are interacted with the dummies of *efficacy* and *R&D*.

[*Table 5 Panel B here*]

In their study, Chen et al. (2015) find that national culture significantly affects corporate cash holdings. In order to ensure that we adequately control for this important finding for analyzing the speed of adjustment of corporate cash holdings, we run the equation (3) and extending it to include the scores of cultural dimensions of Hofstede. Following Chen et al. (2015), we consider Hofstede's individualism index (INDV)[7] and uncertainty avoidance index (UNCERT). The results are reported in Table 5, Panel B. INDV measures the degree of interdependence among its members while UNCERT is the extent to which the members of a culture feel threatened about ambiguous or unknown situations. Heine et al. (1999) emphasize that people in individualistic cultures tend to overestimate their abilities while Griffin et al. (2009) argue that uncertainty avoidance cultures prefer cleaner rules of conduct. As argued by Chen et al. (2015), managers in a collectivist culture tend to hold high cash to give signal that the firm is well managed and they hold more cash in high uncertainty avoidance cultures. We include the cultural dimensions in our model and we find that although there is no significant change in the speed of cash adjustments, the cash holdings get affected by culture. The results however are similar to Chen et al. (2015) except individualistic countries with high board efficacy where managers hold more cash. This may be due to high board supervision effectively controls individualistic trait of overconfidence. Even if a country has high INDV scores, the managers tend to hold more cash which substantially mitigates agency problem. This is true for uncertainty avoidance as well where managers in countries with high board efficacy with increase in uncertainty hold more cash. This confirms that managers in our sample countries hold cash as a precautionary motive to deal with future uncertainties.

In order to ensure that our models do not suffer from multicollinearity, we report the variance inflation factors (VIF) for each independent variable as shown in Appendix III. Based on mildly

[7] The average scores of INDV and UNCERT respectively are India (48, 40), China (20, 36), Malaysia (26, 36), Pakistan (14, 70), Indonesia (26, 36), South Korea (18, 85) and Philippines (32, 44)

high VIFs for two of our independent variables *Ease* and *R&D*, we use the centered variables approach to remove multicollinearity. The results are reported in Appendix IV wherein we observe that using this approach, the VIFs of all the explanator variables are within the acceptable level of 5. Further, we run the regression for models reported in Table IV, Panel A using the centered variables and the results are reported in Appendix V. This standardisation does not change the economic interpretation of the variables even if the numeric values of the coefficients have changed slightly.

6. Conclusion

We study a sample of emerging Asian countries as per the Morgan Stanley Capital International Emerging Market Classification, 2019 (MSCI). Extant literature establish that cash holdings of a firm is affected by firm level and institutional level factors. In this paper, we extend the research on the dynamics of corporate cash holdings by considering factors measured at the country level. The basic objective is to understand the impact of a business environment at macro level on the cash management policies of the firms. We consider five factors (spending on R&D and efficacy of corporate boards, financial development, ease of access to loans and financing through equity measured at the country level.

Our results provide an insight that the country level variables measured have significant impact on corporate cash holdings. The business environment of a country has significant impact on a firm's cash holdings policy. A country's financial development and a well-functioning equity markets are key systemic determinants of cash management of firms operating in that country. Further, our results also show that managers in emerging countries mitigate cash holdings and adjustment mechanism by managing the R&D expenses. Moreover, firms with deficit cash in countries with

easy accessibility to loans have a faster adjustment to the target as compared to the firms with excess cash. Consequently, firms in these countries hold less cash. We also provide evidence that firms have asymmetric mechanism to adjust their cash holdings. In effect, firms follow a pecking order for adjusting the cash after controlling for systemic and firm specific variables. When a firm holds excess cash, it is more likely to use cash from investing activities for reducing the cash level to the target and in case of deficit cash holdings, the adjustment to the target happens through the financing activities. We also find board activism plays an important part in cash management policies of firms in these countries and our results compliments those of Dittmar et.al. (2003), Pinkowitz et.al. (2006) who measure corporate governance at the firm level. The results also provide evidence that systemic factors (country level variables) have significant impact on a firm's cash management policies. We also provide evidence that although cultural dimension of a country does not significantly affect cash holdings adjustment, they however affect cash holdings especially in countries where board efficacy is high.

Our study has important practical implications. Managers will find it easy to adjust cash in the countries with high scores of the institutional variables. The study also provides guidance to international investors to evaluate the overall business environment prevailing in these countries because these institutional variable scores indicate on the ease of doing business. Future research can investigate the channels of investment of cash when a firm has excess liquidity and how do they differ across countries with country specific factors. For managers, the study is an important reference to understand and design cash management policies by considering factors measured at the country level. It also provides them a clearer understanding about the role of corporate boards and information asymmetry in cash holdings.

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Table 1: Panel A

Median values of the firm specific and country specific variables

	Number of firms	Firm Years	Cash	NWC	Debt	Capex	Size	CFO	CFF	CFI	Fin_equity	FD	Ease	Efficacy	R&D
India	3777	40101	0.021	0.226	0.323	0.052	2.84	0.035	0.014	-0.044	4.59	4.89	3.57	4.503	3.77
China	3576	36488	0.151	0.142	0.173	0.039	5.53	0.049	0.0004	-0.049	4.03	4.22	3.13	4.39	4.202
Philippines	207	1791	0.064	0.066	0.156	0.018	4.38	0.023	0.000	-0.029	4.36	4.18	3.14	4.81	3.36
Malaysia	897	10,661	0.056	0.185	0.160	0.019	4.23	0.045	-0.011	-0.024	4.90	5.40	4.52	5.34	4.70
Indonesia	562	6306	0.054	0.139	0.264	0.03	4.77	0.043	0.000	-0.037	4.43	4.30	3.92	4.79	4.02
Pakistan	345	3482	0.015	0.188	0.318	0.033	3.59	0.045	-0.009	-0.031	3.78	4.03	3.20	4.06	3.06
S. Korea	2043	22,585	0.061	0.151	0.203	0.029	4.72	0.049	0.00013	-0.053	3.89	3.95	2.23	4.22	4.74
Total	11407	125,414													
Standard Deviation			0.044	0.0506	0.072	0.011	0.87	0.0093	0.008	0.011	0.402	0.53	0.72	0.43	0.63

Cash is defined as cash and cash equivalents, NWC is net working capital, debt is total interest bearing debt, Capex is capital expenditure, CFO is cash from operations, CFF is the cash from financing activities and CFI is cash from investment activities. All these variables are scaled by total non-cash assets. Size is measured as natural logarithm of total non-cash assets. FD is the scores on Financial development on a scale of 1(lowest) to 7 (highest), Ease is the score on ease of access to loans on a scale of 1(lowest) to 7 (highest), Efficacy is the score of board efficiency on a scale of 1(lowest) to 7 (highest) and R&D is the score of company spending on R&D activities on a scale of 1(lowest) to 7 (highest). All these scores are collected from the WEF Database.

Table 1: Panel B
Pearson's Correlation Matrix

	Capex	Cash	CFO	R&D	Dividend	Ease	Efficacy	Fin_equity	FD	NWC_	PPE_	Tot_Debt
Capex	1.000000											
Cash	0.0311*	1.000										
	(7.330)											
CFO	-0.229*	0.094*	1.000									
	(-55.622)	(22.391)										
R&D	0.016*	0.159*	0.052*	1.000								
	(3.753)	(38.049)	(12.307)									
Dividend	-0.165*	0.105*	0.234*	0.034*	1.000000							
	(-39.526)	(24.974)	(56.827)	(8.138)								
Ease	0.006	-0.014**	-0.021**	0.341*	0.072*	1.000						
	(1.597)	(-3.297)	(-5.003)	(85.259)	(16.955)							
Efficacy	0.021**	0.082*	0.002	0.454*	0.078*	0.729*	1.000					
	(5.017)	(19.604)	(0.642)	(12.0696)	(18.436)	(25.368)						
Fin_equity	0.002	-0.024*	-0.029*	0.087*	0.015**	0.572*	(0.751)*	1.000				
	(0.508)	(-5.857)	(-7.062)	(20.742)	(3.547)	(16.437)	(26.188)					
FD	0.011	-0.019**	-0.040*	0.071*	0.053*	0.505*	0.701*	0.785*	1.000			
	(2.596)	(-4.700)	(-9.558)	(16.866)	(12.506)	(13.743)	(23.578)	(29.112)				
NWC	0.041*	-0.174*	-0.063*	-0.058*	0.065*	0.047*	-0.015*	0.051*	0.076*	1.000		
	(9.729)	(-41.648)	(-15.012)	(-13.688)	(15.460)	(11.144)	(-3.583)	(11.908)	(18.16543)			
PPE	-0.185*	-0.131*	0.126*	-0.084*	0.074*	0.040*	0.002	0.014**	0.012	-0.219*	1.000	
	(-44.515)	(-31.104)	(29.914)	(-19.950)	(17.593)	(9.437)	(0.482)	(3.394)	(2.804)	(-53.090)		
Tot_Debt	-0.032*	-0.120*	-0.123*	-0.132*	-0.137*	0.002	-0.058*	0.014**	-0.005	-0.231*	0.195*	1.000
	(-7.453)	(-28.553)	(-29.193)	(-31.352)	(-32.675)	(0.659)	(-13.661)	(3.238)	(-1.240)	(-55.901)	(47.054)	

**Significant at 1%; **Significant at 5%; Figures in parentheses are t-statistics*

Table 2

Results of the first stage regression

$$Cash_{it}^{target} = \alpha_i + \gamma_t + \pi_t \beta' X + \nu_{it}$$

Variables	Coefficient
Capex	0.034* (0.003924)
CFO	0.041* (0.002135)
Div	0.014* (0.000680)
NWC	-0.077* (0.001504)
PPE	-0.018* (0.000736)
Size	-0.013* (0.000269)
Debt	-0.024* (0.001144)
Constant	0.150* (0.001231)
Firm years	125,414
Adj R^2	0.48
F-stat	14.53*
p-value	0.000

*Significant at 1%; figure in parentheses of the parameters is standard error.

The dependent variable is Cash as a percent of total assets, CFO is the cash from operations as a percentage of total assets, Div is a dummy variable which is equal to 1 if paid in year t and 0 otherwise, NWC is net working capital measured as change in current assets less change in current liabilities between period t and t-1, PPE is the plant, property and equipment – a proxy for asset tangibility, Size is the firm size measured as natural logarithm of total assets and debt is long term and short term interest bearing liabilities as a percentage of total assets.

Table 3: Panel A

Target adjustment behaviour

$$\Delta\, Cash_{it} = constant + \ \lambda\left(Cash_{it}^{target} - Cash_{it-1}\right) + Country_{specific} * \left(Cash_{it}^{target} - Cash_{it-1}\right) + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)	(5)
λ	0.316 (0.022)*	0.320 (0.0225) *	0.322 (0.0224) *	0.324(0.022) *	0.310 (0.022) *
FD* Target	0.023 (0.009) *				
Ease* Target		-0.006 (0.0089) *			
Efficacy * Target			0.004 (0.008) *		
Fin_equity* Target				0.043 (0.008) *	
R&D * Target					-0.018 (0.010) *
Constant	-0.044 (0.002) *	-0.044 (0.002) *	-0.044 (0.002) *	-0.044 (0.002) *	-0.044 (0.002) *
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Adj R^2	0.49	0.49	0.49	0.49	0.49
F-stat (p-value)	11.340 (0.00) *	10.254 (0.00) *	10.316(0.000) *	10.170 (0.00) *	10.610(0.00) *
Observations	125,414	125,414	125,414	125,414	125,414
AR(1) *p>Z*	0.00	0.00	0.00	0.00	0.00
AR(2) *p>Z*	0.323	0.365	0.239	0.331	0.298
Sargan test; *p>Chi-Sq*	0.296	0.312	0.271	0.331	0.436

*Significant at 1%; figure in parentheses of the parameters is the standard error.

The dependent variable is the cash change between t and t-1. Cash is defined as cash and cash equivalents divided by total non-cash assets, target cash is the optimum level of cash identified from first stage regression and λ measures its speed of adjustment. FD is the scores on Financial development on a scale of 1(lowest) to 7 (highest), Ease is the score on ease of access to loans on a scale of 1(lowest) to 7 (highest), Fin_equity is the score of financing through equity on a scale of 1(lowest) to 7 (highest), Efficacy is the score of board efficiency on a scale of 1(lowest) to 7 (highest) and R&D is the score of company spending on R&D activities on a scale of 1(lowest) to 7 (highest). The results are estimate using the Sys-GMM method of Blundell and Bond (1998).

Table 3: Panel B

Excess and deficit cash and adjustment mechanism

$$\Delta Cash_{it} = \alpha_0 + \alpha_1 \lambda\, target\ cash_{it} + \alpha_2 target * CashDum + \alpha_3 \Delta CF_{it} * CashDum + \vartheta_i + \pi_t + \varepsilon_{it}$$

	Column 1 Excess Cash	Column 2 Deficit Cash
$Constant$	0.062 (0.004)*	1.260 (0.010)*
$target\ cash$	0.263 (0.003)*	0.158 (0.003)*
$target\ cash * CashDum^e$	0.604 (0.017)*	
$\Delta CFO_{it} * CashDum^e$ (i)	0.018 (0.002)*	
$\Delta CFF_{it} * CashDum^e$(ii)	-0.004 (0.002)*	
$\Delta CFI_{it} * CashDum^e$(iii)	0.068 (0.002)*	
$target\ cash * CashDum^d$		0.148 (0.015)*
$\Delta CFO_{it} * CashDum^d$(iv)		0.305 (0.004)*
$\Delta CFF_{it} * CashDum^d$(v)		0.346 (0.003)*
$\Delta CFI_{it} * CashDum^d$(vi)		0.297 (0.004)*
Controls	Country specific variables	Country specific variables
N	125,414	125,414
Adj R^2	0.16	0.40
F-test (model)	797.7	2848
F-test (for equivalence of the coefficients) (i)= (ii) (i) =(iii) (ii)=(iii) (iv) =(v) (iv)=(vi) (v)=(vi)	 0.00 0.00 0.00	 0.00 0.00 0.00
Rank	CFI (1) CFO (2) CFF (3)	CFF (1) CFO (2) CFF (3)

**Significant at 1%, figure in parentheses of the parameters is the standard error. Target cash is calculated for each firm every year from the first pass regression, CF are the cash flow measures and includes Cash from Operations (CFO), Cash from Financing (CFF) and Cash from Investing activities (CFI), CashDum^e is a dummy variable and is coded as 1 if the firm holds excess cash and 0 otherwise, CashDum^d is a dummy variable and is coded as 1 if the firm holds deficit cash and 0 otherwise λ measures the speed of adjustment. Rank refers to the pecking order mechanism for adjusting cash adjustments.*

Table 4: Panel A

Country specific variables and cash holdings

	1	2	3	4	5
Constant	0.153*	0.017*	0.017*	0.017*	0.017*
	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)
Capex	0.069*	0.068*	0.068*	0.068*	0.068*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
CFO	0.0618*	0.0618*	0.0618*	0.0618*	0.0618*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Dividend	0.023*	0.023*	0.023*	0.023*	0.023*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
NWC	-0.075*	-0.075*	-0.075*	-0.075*	-0.075*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
PPE	-0.033*	-0.033*	-0.033*	-0.033*	-0.033*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Debt	-0.023*	-0.023*	-0.023*	-0.023*	-0.023*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size	-0.024*	-0.024*	-0.024*	-0.024*	-0.024*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FD	0.036*				
	(0.001)				
Ease		0.001*			
		(0.000)			
Fin_equity			0.002*		
			(0.000)		
R&D				0.003*	
				(0.000)	
Efficacy					0.003**
					(0.001)
Observations	125,414	125,414	125,414	125,414	125,414
Adj R^2	0.57	0.57	0.55	0.57	0.50
F-stat (p-value)	10.24 (0.00)	8.1 (0.00)	10.24 (0.00)	10.24 (0.00)	14.03 (0.00)

**Significant at 1%, **Significant at 5%, figure in parentheses of the parameters is the standard error. The dependent variable is cash as a percent of total non-cash assets, capex is the capital expenditure, CFO is cash from operations, dividend is a binary variable and is equal to 1 if paid and 0 otherwise, NWC is the net working capital, PPE is the gross plant, property and equipment, Debt is total interest bearing debt, Size is the natural logarithm of total non-cash assets, . FD is the scores on Financial development on a scale of 1(lowest) to 7 (highest), Ease is the score on ease of access to loans on a scale of 1(lowest) to 7 (highest), Fin_equity is the score of financing through equity on a scale of 1(lowest) to 7 (highest), Efficacy is the score of board efficiency on a scale of 1(lowest) to 7 (highest) and R&D is the score of company spending on R&D activities on a scale of 1(lowest) to 7 (highest).*

Table 4: Panel B

Results of cash adjustment dynamics

$$\Delta\, Cash_{it} = \phi_0 + \phi_1 \lambda\, target\ cash + \phi_2 CFO * Cash_{Dummy}{}^{H}_{it} + \phi_3 CFF * Cash_{Dummy}{}^{H}_{it} + \phi_4 CFI * Cash_{Dummy}{}^{H}_{it} + \phi_5 Efficacy * Cash^{H}_{it} + \phi_6 (R\&D * Cash^{H}_{it}) + \varepsilon_{it}$$

	FD	Ease	Fin_equity
$constant$	0.007* (0.0049)	0.005* (0.0026)	0.001* (0.003)
$Target\ cash$	0.375* (0.0053)	0.375* (0.0037)	0.376* (0.005)
$CFO * Cash_{Dummy}{}^{H}_{it}$	0.376* (0.004)	0.376* (0.004)	0.377* (0.004)
$CFF * Cash_{Dummy}{}^{H}_{it}$	0.269* (0.003)	0.269* (0.003)	0.269* (0.003)
$CFI * Cash_{Dummy}{}^{H}_{it}$	0.450* (0.004)	0.451* (0.004)	0.451* (0.004)
$Efficacy * Cash^{H}_{it}$	0.107* (0.005)	0.011*** (0.005)	0.008 (0.005)
$R\&D * Cash^{H}_{it}$	0.019* (0.006)	0.021** (0.006)	0.021** (0.006)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	125,414	125,414	125,414
Adj R^2	0.40	0.40	0.40
F-stat	6.55*	6.55*	6.55*

*Significant at 1%; ** Significant at 5% and *** Significant at 10% levels; figure in parentheses of the parameters is the standard error

Cash is defined as cash divided by total assets, target cash is the optimum level of cash identified from first stage regression and λ *measures its speed of adjustment, CFO is the cash from operations as a percentage of total assets, CFF is the cash from financing activities as a percentage of total assets, CFI is the cash from investing activities as a percentage of total assets,* $Cash_{Dummy}{}^{H}_{it}$ *is a dummy variable which equals 1 if the deviation from the target is more than the median and 0 otherwise. Fin_equity is the score of financing through equity on a scale of 1(lowest) to 7 (highest), Efficacy is the score of board efficiency on a scale of 1(lowest) to 7 (highest) and R&D is the score of company spending on R&D activities on a scale of 1(lowest) to 7 (highest).*

Table 5

Panel A: Investor's protection and speed of cash adjustment

$$\Delta\, Cash_{it} = constant + \ \lambda\left(Cash_{it}^{target} - Cash_{it-1}\right) + Country_{specific} * \left(Cash_{it}^{target} - Cash_{it-1}\right) \ + \ inv_{prot} * Country_{specific} + \varepsilon_{it} + \ \varepsilon_{it}$$

	FD	Ease	Efficacy	Fin_equity	R&D
λ	0.278*	0.247*	0.278*	0.262*	0.314*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
County_specific* Cash_dev	0.877*	-0.566*	0.789*	0.885*	-0.859*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)
County_specific*inv_prot	-0.000*	-0.000*	-0.000	-0.000*	-0.000
	(0.000)	(0.000)	(0.210)	(0.000)	(0.170)
Constant	0.006*	0.005*	0.005*	0.006*	0.005*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj R^2	0.59	0.63	0.59	0.61	0.53
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Observations	48629	48629	48629	48629	48629

*Significant at 1%; Figures in parentheses are HAC standard errors.

ΔCash is the change in cash, $Cash_{it}^{target}$ is the target cash estimated from equation (1), $Cash_{it}^{target} - Cash_{it-1}$ indicates deviation from optimal cash holdings, country specific variables include financial development (FD), ease of access to loans (ease), board efficacy (efficacy), financing through equity (fin_equity) and research and development (R&D) and inv_prot is the score for investor protection in a country measured on a scale of 1 to 10 with countries with a score of 1 have least investors protection and 10 with the strongest. Figures in bracket are the HAC standard errors.

Panel B: National culture and speed of cash adjustment

$$\Delta Cash_{it} = constant + \lambda\left(Cash_{it}^{target} - Cash_{it-1}\right) + Country_{specific} * \left(Cash_{it}^{target} - Cash_{it-1}\right) + INDV * Country_{specific} + UNCERT * Country_{specific} + \varepsilon_{it}$$

	FD	Ease	Efficacy	Fin_equity	R&D
λ	0.213* (0.003)	0.212* (0.003)	0.205* (0.003)	0.230* (0.003)	0.296* (0.004)
County_specific* Cash_dev	0.796* (0.043)	-0.344* (0.051)	0.701* (0.002)	0.612* (0.004)	-0.778* (0.006)
INDV	-0.053** (0.021)	-0.001 (0.023)	0.033* (0.002)	-0.11* (0.013)	-0.005** (0.002)
UNCERT	0.065* (0.012)	0.011* (0.003)	-0.023* (0.001)	0.012** (0.005)	0.035* (0.001)
County_specific*INDV	0.055* (0.003)	0.002* (0.000)	0.074* (0.004)	0.009* (0.000)	0.01* (0.005)
County_specific*UNCERT	-0.021* (0.001)	0.056* (0.001)	0.097* (0.015)	-0.025** (0.005)	-0.033* (0.001)
Constant	0.006* (0.000)	0.005* (0.000)	0.005* (0.000)	0.006* (0.000)	0.005* (0.000)
Adj R^2	0.64	0.55	0.71	0.66	0.59
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Observations	48629	48629	48629	48629	48629

*Significant at 1%; **Significant at 5%; Figures in parentheses are HAC standard errors.

$\Delta Cash$ is the change in cash, $Cash_{it}^{target}$ is the target cash estimated from equation (1), $Cash_{it}^{target} - Cash_{it-1}$ indicates deviation from optimal cash holdings, country specific variables include financial development (FD), ease of access to loans (ease), board efficacy (efficacy), financing through equity (fin_equity) and research and development (R&D) and INDV is the dummy for Hofstede's individualism index (if a firm has INDV score more than the median, it is coded as 1 and 0 otherwise) and UNCERT is the dummy for Hofstede's uncertainty avoidance index (if a firm has INDV score more than the median, it is coded as 1 and 0 otherwise). Figures in bracket are the HAC standard errors.

Appendix I

Results of first pass regression using total revenue as deflator

$$Cash_{it}^{target} = \alpha_i + \gamma_t + \pi_t \beta' X + \nu_{it}$$

Variables	Coefficient
Capex	0.0293* (0.00056)
CFO	0.04911* (0.000176)
Div	0.0105* (0.0008790)
NWC	-0.08854* (0.001504)
PPE	-0.02076* (0.000362)
Size	-0.0208* (0.000665)
Debt	-0.0214* (0.001498)
Constant	0.2069* (0.000165)
Firm years	125,414
Adj R^2	0.522
F-stat	17.56*
p-value	0.000

*Indicates statistical significance at 1%; The figures in brackets are HAC standard errors

Appendix II

Institutional variables and speed of cash adjustment

$$\Delta\, Cash_{it} = constant + \lambda\left(Cash_{it}^{target} - Cash_{it-1}\right) + Country_{specific} * \left(Cash_{it}^{target} - Cash_{it-1}\right) + \varepsilon_{it}$$

λ	0.293 (0.022)*
FD* Target	0.061 (0.018)*
Ease* Target	-0.026 (0.007)*
Efficacy * Target	0.008 (0.007)
Fin_equity* Target	0.024 (0.019)
R&D * Target	-0.020 (0.006)*
Constant	-0.061 (0.002)*
Year FE	YES
Firm FE	YES
Adj R^2	0.61
F-stat (p-value)	35.010 (0.00)*
Observations	125,414
AR(1) *p>Z*	0.00
AR(2) *p>Z*	0.163
Sargan-J *p>Chi-Sq*	0.358

*Significant at 1%; figure in parentheses of the parameters is the standard error.

The dependent variable is the cash change between t and t-1. Cash is defined as cash and cash equivalents divided by total non-cash assets, target cash is the optimum level of cash identified from first stage regression and λ measures its speed of adjustment. FD is the scores on Financial development on a scale of 1(lowest) to 7 (highest), Ease is the score on ease of access to loans on a scale of 1(lowest) to 7 (highest), Fin_equity is the score of financing through equity on a scale of 1(lowest) to 7 (highest), Efficacy is the score of board efficiency on a scale of 1(lowest) to 7 (highest) and R&D is the score of company spending on R&D activities on a scale of 1(lowest) to 7 (highest). The results are estimate using the Sys-GMM method of Blundell and Bond (1998).

Appendix III

Table showing the VIFs

	Coefficient	Standard error	VIF
Capex	0.035*	0.007	2.56
CFO	0.024*	0.003	1.03
Dividend	0.035*	0.001	3.36
NWC	-0.102*	0.002	2.47
PPE	-0.025*	0.001	1.99
Debt	-0.033*	0.002	2.45
Size	-0.028*	0.000	1.58
FD	0.0005*	0.001	5.02
Ease	0.0001*	0.001	6.33
Fin_equity	0.0002*	0.002	2.58
R&D	0.0003*	0.002	5.13
Efficacy	0.0003**	0.001	1.36

Appendix IV

Table showing VIFs for regressions with centered variables

	Coefficient	Standard error	VIF
Capex	0.005*	0.02	1.96
CFO	0.101*	0.003	1.12
Dividend	0.051*	0.001	3.36
NWC	-0.065*	0.002	1.55
PPE	-0.088*	0.001	2.36
Debt	-0.037*	0.002	2.45
Size	-0.015*	0.000	1.58
FD	0.0013*	0.001	3.56
Ease	0.0001*	0.000	2.96
Fin_equity	0.0002*	0.000	1.25
R&D	0.0003*	0.000	4.85
Efficacy	0.0024**	0.001	1.05

Appendix V

Country specific variables and cash holdings

	1	2	3	4	5
Constant	0.101* (0.006)	0.023* (0.004)	0.023* (0.004)	0.031* (0.004)	0.022* (0.004)
Capex	0.082* (0.007)	0.068* (0.007)	0.074* (0.007)	0.051* (0.007)	0.045* (0.007)
CFO	0.074* (0.003)	0.071* (0.003)	0.071* (0.003)	0.078* (0.003)	0.065* (0.003)
Dividend	0.023* (0.001)	0.023* (0.001)	0.023* (0.001)	0.023* (0.001)	0.023* (0.001)
NWC	-0.066* (0.002)	-0.066* (0.002)	-0.066* (0.002)	-0.066* (0.002)	-0.066* (0.002)
PPE	-0.028* (0.001)	-0.028* (0.001)	-0.028* (0.001)	-0.028* (0.001)	-0.031* (0.001)
Debt	-0.023* (0.002)	-0.023* (0.002)	-0.023* (0.002)	-0.023* (0.002)	-0.023* (0.002)
Size	-0.017* (0.000)	-0.017*	-0.017*	-0.017*	-0.017*
FD	0.028* (0.001)				
Ease		0.003* (0.000)			
Fin_equity			0.001* (0.000)		
R&D				0.002* (0.000)	
Efficacy					0.002** (0.001)
Observations	125,414	125,414	125,414	125,414	125,414
Adj R^2	0.52	0.52	0.55	0.54	0.48
F-stat (p-value)	17.01 (0.00)	11.1 (0.00)	9.13 (0.00)	13.24 (0.00)	14.03 (0.00)

**Significant at 1%, **Significant at 5%, figure in parentheses of the parameters is the standard error. The dependent variable is cash as a percent of total non-cash assets, capex is the capital expenditure, CFO is cash from operations, dividend is a binary variable and is equal to 1 if paid and 0 otherwise, NWC is the net working capital, PPE is the gross plant, property and equipment, Debt is total interest bearing debt, Size is the natural logarithm of total non-cash assets, . FD is the scores on Financial development on a scale of 1(lowest) to 7 (highest), Ease is the score on ease of access to loans on a scale of 1(lowest) to 7 (highest), Fin_equity is the score of financing through equity on a scale of 1(lowest) to 7 (highest), Efficacy is the score of board efficiency on a scale of 1(lowest) to 7 (highest) and R&D is the score of company spending on R&D activities on a scale of 1(lowest) to 7 (highest).*