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Cash Holdings Adjustment Speed and Managerial Ability

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Abstract

Using the partial adjustment model of cash holding, we find that managerial ability is negatively related to adjustment speed of cash holdings toward the target, particularly when the firm has excess cash. We also find that the relation between managerial ability and cash holding adjustment speed is weaker in the presence of the internal capital market. Additionally, we provide evidence that firms with higher managerial ability are less likely to make inefficient investments when they have excess cash, implying that high-ability managers are willing to hold a large amount of cash to make timely investments.

Keywords Cash holdings; Internal capital market; Investment efficiency; Managerial ability; Partial adjustment model

JEL Classification: G32

1. Introduction

In 2013, Carl Icahn purchased Apple Inc.'s stocks and argued that Apple should utilize its cash holdings by redistributing them to equity investors through dividends and stock repurchases. Similarly, in 2016, Paul Singer, under the name of Elliott Management, requested Samsung Electronics Co. to increase dividend payments and future payouts in order to increase shareholders' wealth. A common feature in these cases is that they are both successful companies with large cash holdings. Apple and Samsung Electronics are widely known for their iconic managers, Steve Jobs and Kun-Hee Lee, respectively, and shareholders have benefited from these companies' strong performance that is a result of their managers'

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excellent investment and operating decisions. Thus, the managerial ability of these companies is a good reason to hold larger cash holdings than other less competent companies. While many prior studies have highlighted the importance of cash holding management for the survival and growth of modern corporations (Opler *et al.*, 1999; Bates *et al.*, 2009), they have failed to provide a comprehensive understanding of how managerial ability is associated with cash holding decisions, as shown in these cases.

To shed light on the relation between managerial ability and cash holding decisions, we focus on the adjustment speed of cash holding towards the optimal level, because cash holding dynamics illustrate how specific determinants are related to trade-offs of cash holding decisions. Opler *et al.* (1999) document that firms have a target level of cash holdings and, whenever there is a deviation between the actual and the target cash holdings, they adjust it towards that target. Dittmar and Duchin (2011) also estimate that firms close the deviation between actual and target level of cash holdings by 21–46% in each year. Jiang and Lie (2016) suggest that firms close 31% of the deviation from the target level of cash holdings each year and this speed is faster when they have larger cash holdings than the target. We link this line of literature to managerial ability because several studies provide evidence that higher managerial ability is related to better forecasting ability (Bamber *et al.*, 2010; Baik *et al.*, 2011), which leads to higher future performance and firm value (Chemmanur and Paeglis, 2005; Agarwal *et al.*, 2011; Demerjian *et al.*, 2013; Goodman *et al.*, 2013). Cash holding adjustments require estimating the target level of cash holdings, detecting the deviation of actual cash holdings from the target, accumulating cash savings, or spending cash through investments and redistributions. These activities require managers to check the current status of financial positions and forecast future cash flows. Furthermore, whether the firm spends cash on investments, debt repayments, or on stock repurchase depends on managerial abilities to capture growth opportunities and communicate with current and attract potential investors.

When a firm has cash holdings smaller than the optimal level, more able managers of the firm will detect a liquidity problem more easily and preemptively so as to avoid external financing costs, and they will exhibit a faster upward adjustment speed of cash holdings towards the target. Also, managers with better ability in firms having higher cash holdings than the optimal level are more likely to detect a decreasing marginal value of cash holding and the potential damage of firm value due to a free cash flow problem, and will then close the gap between the actual and target level of cash holdings more swiftly. These arguments lead us to predict a positive relation between managerial ability and cash holding adjustment speeds. However, small cash holdings would not damage or threaten shareholder wealth for firms with high-ability managers because those managers would better cope with low cash holdings by efficient liquidity management and a cooperative relationship with lenders or suppliers. Also, a higher level of cash holdings relative to the optimal level can be used to make timely investments if more able managers are better at detecting investment opportunities than less able managers.

We then formulate the study's hypothesis on the relation between managerial ability and cash holding adjustment speeds incorporating the mediating role of the internal capital market. The internal capital market transfers cash from firms with large cash holdings to firms with financial distress or immediate needs for investments (Shin and Park, 1999; Lee *et al.*, 2009; Almeida *et al.*, 2015). This implies that cash holdings may be determined not solely by managers' decision making if a firm is affiliated with the business group. We thus predict that, if any, the extent to which managerial ability is related with cash holding adjustment is weaker for firms with an internal capital market.

We use the data of firms listed in the Korean stock market from 2000 to 2016 for the association between managerial ability and cash holding adjustment speeds.[1] The business group accounts for a large portion of listed companies on the Korean stock market as well as in the overall Korean economy. Prior studies used Korean data to report the role of internal capital market in intra-transactions between affiliates of business groups (e.g., Shin and Park, 1999; Baek *et al.*, 2006; Lee *et al.*, 2009; Byun *et al.*, 2013; Almeida *et al.*, 2015). Our empirical proxy of managerial ability is based on Demerjian *et al.* (2012), who construct the extent of managerial efficiency in maximizing the outcome (sales revenue) using a given level of inputs (e.g., cost of goods sold, selling, general and administrative expense, PPE, and intangible assets).

We find that higher managerial ability is associated with slower cash holding adjustment towards the target cash level, which is estimated using various determinants. In particular, managerial ability is negatively related to adjustment speed of cash holdings when cash holdings are larger than the target level, indicating that managers with higher ability are less likely to dissipate excess cash than those with lower ability. Harford *et al.* (2008) argue that a high level of cash holdings could draw the attention of shareholders and that entrenched managers disgorge excess cash to avoid unwanted public confrontation. Our result implies that managers with higher ability are less concerned about this kind of attention in relation to large cash holdings. However, the effect of managerial ability is not significant when cash holdings are smaller than the target level. Insignificant results for firms having smaller cash than the target level may imply a liquidity problem and financial distress due to cash shortfalls being costly even for high-ability managers.

We then turn to examine the role of the internal capital market in the relation between managerial ability and cash holding adjustments. We use an affiliation with business group ('chaebol' in Korean) as the proxy of an availability of internal capital market. Empirical results show that the negative relation between managerial ability and adjustment speed of cash holdings is prevalent only for firms unaffiliated with the business group. This implies that internal capital market alleviates the

[1]We test the effect of internal capital markets on the relation between managerial ability and cash adjustment speed for the sample period of 2001–2011 due to the limited availability of business group data.

firm's concern on financial distress and its incentive to stockpile cash holdings, thus reducing the role of managerial ability in relation to cash holding adjustments.

Finally, we test one of the reasons that high-ability managers exhibit slower adjustment speed of cash holding than low-ability managers when firms have cash holdings larger than the target. One possible explanation would be that managers with better ability to detect growth opportunities stockpile cash so are able to make timely investments. Although such an accumulation of cash holdings can attract attention from outside investors and threaten managers' positions (Harford *et al.*, 2008), managers with higher ability would be in a better position to defend their cash holding decisions by pointing out their superior performance to their competitors. To check this explanation, we construct the variable of abnormal investment using the regression of investments on Tobin's *Q*, operating cash flows, and sales growth (Biddle *et al.*, 2009). We find that firms with large cash holdings are less likely to make inefficient investments, particularly over-investment, when they are run by managers with higher ability. This implies that firms with a higher managerial ability maintain a higher level of cash holdings to execute timely investments, avoiding an underinvestment problem (Dittmar and Mahrt-Smith, 2007; Harford *et al.*, 2008).

This study contributes to the literature by presenting that managerial ability can be the determinant of cash holding dynamics. Particularly, we show that high-ability managers with excess cash are less likely to reduce the level of cash holdings and engage in inefficient investment decisions. This explains why the value of cash holdings should be higher for firms with high-ability managers (Gan and Park, 2017). Given that investment decision making is closely related to future performance and firm value, this finding highlights the importance of managerial ability in the interrelation among cash holding, investment, and firm value. This study also provides evidence that the internal capital market mitigates the relation between cash holding changes and its determinant. In other words, even if a firm is managed by an executive with inferior ability, it is unlikely to exhibit the fast adjustment speed of cash holding towards the target level in the presence of internal capital market because its cash deficit can be amended by other affiliated firms and its excess cash can be spent through the internal capital market.

2. Prior Literature and Hypothesis Development

2.1. Adjustment of Cash Holdings

Cash holding is one of the most important components for the survival of modern corporations and many researchers have investigated the determinants of a firm's cash holding policy. Among them, Opler *et al.* (1999) and Bates *et al.* (2009) provide comprehensive analyses on firm characteristics that influence the level of corporate cash holdings. Firms determine their cash holdings based on their need to avoid expensive external financing, as a precaution against adverse shocks and/or taxes associated with payouts, and as managerial incentive to maximize personal

benefits. In addition, Opler *et al.* (1999) argue that firms have a target level of cash holdings and adjust their cash holdings towards the target when they have smaller or larger actual cash relative to the target. Dittmar and Duchin (2011) estimate cash adjustment speeds ranging from 21% to 46% and report that the adjustment speed of cash holdings towards the target level varies with firm age and firm performance. Expanding these studies, Jiang and Lie (2016) show that firms actively close the deviation from the target level of cash holdings each year and this adjustment behavior exhibits faster speed when firms have larger cash holdings than the target.

Jiang and Lie (2016) argue that firms having higher levels of cash holdings exhibit faster adjustment speed of cash holdings towards the target relative to those having lower level of cash holdings, because it is easier and less expensive to reduce cash holdings through debt repayment and stock repurchase than to gear up the level of cash holding through expensive external financing.

2.2. Managerial Ability and Cash Holding Adjustments

Several studies provide evidence on the impact of managers' ability on corporate performance (Chemmanur and Paeglis, 2005; Agarwal *et al.*, 2011; Demerjian *et al.*, 2013). Among others, Agarwal *et al.* (2011) document that firms with high-quality management have lower cost of equity, more stable earnings, higher profitability, and higher market value. Chemmanur and Paeglis (2005) show that higher managerial ability is associated with better firm performance after initial public offerings because better managers are likely to select better projects using IPO proceeds. Related to this, Goodman *et al.* (2013) report that higher management forecast quality is associated with better investment efficiency. Given that more able managers make better earnings forecasts (Bamber *et al.*, 2010; Baik *et al.*, 2011), this provides a hint that the positive relation between managerial ability and firm performance is attributable to able managers' ability to make efficient investment decisions.

Similarly, we can formulate our prediction that higher managerial ability is associated with faster adjustment of cash holdings towards the target level. A firm with lower levels of cash holdings is more likely to suffer from liquidity problems due to debt repayment or payment to suppliers. Smaller cash holdings also increase the probability that the firm needs to rely on costly external financing to fund investments (Opler *et al.*, 1999). Thus, when the firm has smaller cash holdings than the optimal level, more able managers will notice its potential risk and take swifter action to cover cash shortfalls in order to avoid possible bankruptcy and expensive external funding. We postulate similar expectations for firms having larger cash holding than the target. Agency theory argues that holding too much cash does not maximize shareholders' wealth because managers with misaligned incentives prefer keeping cash rather than distributing it to shareholders. Furthermore, large cash holdings would be spent on negative net-present-value projects that maximize managers' rather than shareholders' benefits (Myers, 1977; Myers and Majluf, 1984; Jensen, 1986). Thus, more able managers would maximize shareholder wealth by

distributing rather than keeping excess cash reserves. Overall, we may find a positive relation between managerial ability and the adjustment speed of cash holdings towards the target.

Apart from the benefits of adjusting cash holdings towards the target level, the costs of adjusting cash holdings can also be nontrivial. If the cash ratio is below the target, adjusting requires either cutting back on investments or raising new capital, which imposes great costs on the firm. Cutting back investments induces adjustment costs and the adjustment costs include not only the costs incurred in the current year, but also the costs in the future, since the firm has to make investments when they are in need in subsequent years. In addition, raising new capital requires expensive external financing. On the other hand, if the cash ratio is above the target, the excess cash can be distributed to shareholders through dividends or repurchases or used to reimburse debt. This adjustment is also costly, since shareholders have to pay taxes on dividend income or capital gains. Given the nontrivial costs of cash adjustment, high-ability managers would exhibit faster cash adjustment speed only when the costs of deviating from the target ratios are greater than the costs of cash adjustment.

Further, we note that there is a possibility that managerial ability is negatively associated with the speed at which managers adjust the level of cash holding towards the optimal level. Although lower levels of cash holdings can be a suboptimal choice for firms with average managers, it would not be damaging for firms with high-ability managers because those managers would better cope with low cash holdings by efficient liquidity management and cooperative relationships with lenders or suppliers, which will reduce their motivation to gear up the level of cash holdings. For instance, Bonsall *et al.* (2017) show that managerial ability is positively associated with corporate credit rating and De Franco *et al.* (2017) report that higher managerial ability leads to lower cost of bank loans. Also, since more able managers make more efficient investment decisions (Chemmanur and Paeglis, 2005; Goodman *et al.*, 2013), a higher level of cash holdings than the optimal level would not decrease shareholder wealth if more able managers maintain large temporary cash reserves to capture growth opportunities in a timely fashion. Thus, we are not able to discount the possibility that firms having more able managers exhibit slower adjustment speed of cash holdings towards the target. Therefore, the relation between managerial ability and cash holding adjustment speed is an empirical issue. For this reason, we posit the following null hypothesis:

H1: The relation between managerial ability and the adjustment speed of cash holdings towards the target is insignificant.

2.3. The Impact of Internal Capital Market

Among various motivations, firms hold cash holdings to make timely investments, which can be constrained by a shortfall in cash holdings and limited access to external financing. Thus, if such incentive to accumulate cash holdings is greater than

the costs of deviating from the optimal level of cash holdings, managers would exhibit slower adjustment speed of cash holdings. Meanwhile, the existence of internal capital markets within business groups alleviates a firm's incentive to accumulate cash holdings because it allows the allocation of cash holdings through internal transactions from cash-generating business units to cash-spending business units.[2]

Firms with an internal capital market can easily receive cash support from financially healthier affiliates (Lee *et al.*, 2009), thus alleviating the risk of financial distress.[3] Shin and Park (1999) report that firms affiliated with a business group exhibit lower investment cash flow sensitivity than unaffiliated firms, indicating weaker financial constraints for affiliated firms. Thus, firms affiliated with a business group are less likely to face strong incentives to accumulate more cash as a fund for investment beyond the optimal level. Almeida *et al.* (2015) also document that, by transferring cash from low-growth member firms to high-growth member firms, affiliated firms make timely investments without severe financial constraints, even in financial crisis periods. Therefore, higher cash holdings are less likely to be followed by a decrease in cash holdings (i.e., cash adjustment) for affiliated firms than for unaffiliated firms. These arguments imply that firm-level determinants of cash holdings and adjustments towards the target level would not be important for firms within a business group.

Motivated by the fact that the existence of an internal capital market provides different motives for managers in their cash adjustment decisions, we aim to investigate the effect of internal capital market in the relation between managerial ability and cash adjustment speed. Managers in firms without an internal capital market (i.e., firms unaffiliated with business group or non-chaebol firms) may have greater influence over a firm's cash holding policy, thus, their capability is a critical determinant in cash adjustment decisions. However, for managers in firms with an internal capital market (i.e., firms affiliated with a business group or chaebol firms), the role of managerial ability would diminish, since cash supports by other affiliates enable investments on most occasions. Therefore, we conjecture that the significant relation between managerial ability and cash adjustment speed (either positive or negative) only appears in firms unaffiliated with a business group compared to their counterparts. Since the relation between managerial ability and cash holding adjustment speeds in hypothesis 1 is demonstrated in null form, we also posit the moderating role of the internal capital market in null form.

[2]The importance of the internal capital market on corporate performance is highlighted by Boutin *et al.* (2013) who report that an internal capital market helps firms to enter into a new product market, while preventing the entrance of potential competitors. Although there is a concern that cash transfers through intragroup equity transactions damages minor shareholders (Baek *et al.*, 2006), the internal capital market does not dampen minor shareholder wealth under strict regulation and disclosure requirements (Buchuk *et al.*, 2014).

[3]This inference is enhanced by Byun *et al.* (2013), who document that the cost of debt financing is lower for firms affiliated with business groups than for unaffiliated firms due to the co-insurance effect of a business group.

H2: The existence of an internal capital market has no effect on the relation between managerial ability and the adjustment speed of cash holdings towards the target.

3. Research Design

3.1. Model Specifications

Following prior studies, we first estimate the target level of cash holding, which is determined by the benefits and costs of cash reserves (Opler *et al.*, 1999; Bates *et al.*, 2009; Jiang and Lie, 2016).

$$\begin{aligned} Cash_{i,t} &= \beta_0 Size_{i,t-1} + \beta_1 Tobin's\ Q_{i,t-1} + \beta_2 Industry\ CF\ risk_{i,t-1} \\ &+ \beta_3 CFO_{i,t-1} + \beta_4 WC_{i,t-1} + \beta_5 CAPEX_{i,t-1} + \beta_6 Leverage_{i,t-1} \\ &+ \beta_7 R\&D_{i,t-1} + \beta_8 Dividend_{i,t-1} + \beta_9 Age_{i,t-1} \\ &+ Industry\ Dummies + \varepsilon_{i,t} \end{aligned} \tag{1}$$

where, *Cash* = Cash and equivalents scaled by lagged total assets; *Size* = The natural logarithm of total assets; *Tobin's Q* = Book value of total assets minus book value of equity plus market value of equity, all scaled by total assets; *Industry CF risk* = The mean of the standard deviations of cash flow scaled by total assets over 10 years for firms in the same industry, as defined by the two-digit KSIC code[4] ; *CFO* = EBITDA minus interest, taxes, and common dividends, all scaled by lagged total assets; *WC* = Net working capital minus cash and equivalents scaled by lagged total assets; *Capex* = Capital expenditure scaled by lagged total assets; *Leverage* = The ratio of total debt scaled by total assets; *R&D* = The ratio of R&D expenses on lagged total assets; *Dividend* = An indicator variable equal to one for firms paying a common dividend, zero otherwise; *Age* = Firm age.

We estimate Equation (1) for each year to address the possibility that there is a structural change in relative importance of cash holding determinants over time. In the robustness test, we employ alternative estimations on Equation (1). We then follow Dittmar and Duchin (2011) and Jiang and Lie (2016) to gauge the adjustment speed of cash holding towards the target ($Cash^*$) using the partial adjustment model. The target level of cash holding is based on the estimated coefficients from Equation (1).

$$Cash_{i,t} - Cash_{i,t-1} = \gamma_0 + \gamma_1 (Cash_{i,t-1} - Cash^*_{i,t}) + \gamma_n Controls + \varepsilon_{i,t} \tag{2}$$

In Equation (2), the coefficient on the deviation of actual cash holdings from the target, γ_1, captures average adjustment speed of cash holdings towards the target. The examination of the relation between managerial ability and the adjustment speed of cash holdings towards the target requires the interaction between the

[4]Two-digit KSIC codes corresponds to two-digit SIC codes in the United States.

deviation and managerial ability (*MA*). We use the following Equation (3) to investigate the effect of managerial ability on cash adjustment speed.

$$\begin{aligned} Cash_{i,t} - Cash_{i,t-1} = {} & \gamma_0 + \gamma_1(Cash_{i,t-1} - Cash^*_{i,t}) \\ & + \gamma_2(Cash_{i,t-1} - Cash^*_{i,t}) * MA_{t-1} + \gamma_3 MA_{t-1} \\ & + \gamma_n Controls + Industry\ Dummies \\ & + Year\ Dummies + \varepsilon_{i,t} \end{aligned} \tag{3}$$

MA is an empirical construct of managerial ability introduced by Demerjian *et al.* (2012). If more able managers adjust firms' cash holdings towards the target level more swiftly, we will observe significantly negative coefficients on the interaction between cash deviation and managerial ability, which is γ_2. In contrast, the coefficient on γ_2 will be significantly positive if managerial ability is negatively associated with the adjustment speed of cash holdings towards the target. In Equation (3), we additionally control for variables that are used to construct the optimal level of cash holdings in Equation (1).[5] To address the variations in cash holdings across time and industries, we also include indicator variables for year and two-digit KSIC codes. Standard errors are clustered at the firm level to control for serial correlation within a firm.

3.2. Empirical Construct of Managerial Ability

Demerjian *et al.* (2012) employ data envelopment analysis (DEA) and have introduced a measure of managerial ability based on managers' efficiency in generating revenues. They first use DEA estimation to construct firm efficiency estimates relative to their industry peers, capturing how the firms efficiently transform corporate resources to sales revenue compared to other firms in the same industry. They then gauge manager-specific effects from firm efficiency estimates by regressing firm efficiency estimates on several firm-level characteristics and year fixed effects. Since the development of a DEA-based managerial ability proxy, many prior studies have investigated the importance of managerial impact on various economic outcomes (Baik *et al.*, 2011; Demerjian *et al.*, 2013; Bonsall *et al.*, 2017).

Following Demerjian *et al.* (2012) and Park *et al.* (2016), we construct a managerial ability proxy using accounting information of Korean listed firms from 2000 to 2016. In the DEA model, in order to estimate firm efficiency, we use sales revenue as an output measure and four different revenue-generating resources,

[5]Further, we control for the effect of (external) corporate governance by including the percentage of foreign investors in Equation (2). Jiang and Lie (2016) find that managers of entrenched firms are less eager to disburse cash in excess of the target level. Due to the possibility of correlation between managerial entrenchment and managerial ability, we control for the force of an entrenchment-reducing mechanism as measured by foreign investors based on the evidence that corporate governance affects both managerial entrenchment and cash adjustment speed (Dittmar and Mahrt-Smith, 2007; Harford *et al.*, 2008).

including cost of inventory, SG&A expenditures, net PPE, and intangible assets. Then, we regress firm efficiency estimates on firm characteristics (e.g., firm size, market share, free cash flow indicator, firm age, business segmentations, and foreign currency translation accounts) and year fixed effects. The residual of the regression is defined as managerial ability. Following Demerjian *et al.* (2013), we create decile ranks of ability measure by industry and year and scale them by ten to make the score more comparable across time and to mitigate the influence of extreme observations.[6]

Alternative measures of managerial ability could be media citation on managers (Francis *et al.*, 2008), industry-adjusted stock returns (Fee and Hadlock, 2003), industry-adjusted ROA (Rajgopal *et al.*, 2006), and pay-for-performance sensitivity (Milbourn, 2003). However, those measures are noisy and are unlikely to be solely attributable to managers; rather they would represent significant aspects of the firm. Also, they would capture perceived rather than actual managerial ability. The DEA-based managerial ability, however, is more likely to directly capture the aspects of management (Demerjian *et al.*, 2012).

4. Empirical Results

4.1. Sample Selection

Our sample is based on Korean companies listed on the Korean Stock Exchange (KSE) and Korea Securities Dealers Automated Quotation (KOSDAQ) from 2000 to 2016. We obtain annual financial statement data from *DataGuide*.[7] We exclude firms in financial industries because firms in such industries may have different cash holdings decisions from other firms. In the estimation of Equation (1), we screen the data for missing observations of cash holding and its determinants. We then exclude the observations missing managerial ability in the estimation of Equation (3). We alleviate the outlier effects by truncating all continuous variables at the top and bottom 1% of variable distributions. The final sample is 8503 firm-year observations.

Our use of Korean companies in empirical analyses is due to the strong presence of business groups, so called 'chaebol', in the Korean economy. Prior studies on internal capital markets rely on Korean data to investigate how an internal capital market in a business group influences affiliated firms' investments and performance (e.g., Shin and Park, 1999; Baek *et al.*, 2006; Lee *et al.*, 2009; Byun *et al.*, 2013; Almeida *et al.*, 2015). Affiliated firms in a Korean business group gain the proceeds from internal capital markets through intra-group loans and cross-holding equity transactions. These cash transfers often raise a concern over the

[6]As a robustness test, we use raw measurement of managerial ability and find similar results in our main analyses.

[7]The *DataGuide* from FN Guide (http://www.fnguide.com) is analogous to the United States Wharton Research Data Services.

appropriation of minor shareholders' wealth by controlling shareholders (usually, family members), but at the same time, those transactions allow affiliated firms to make timely investments without facing financial distress.

4.2. Descriptive Statistics

Table 1 presents descriptive statistics for the variables used in our analyses. The key variable of interest is *Cash*, which is defined as cash and cash equivalents scaled by net total assets (i.e., total assets minus cash and cash equivalents). The mean (median) value of *Cash* is 7.9% (5.2%), which indicates that the average Korean listed firm holds about 7.9% of their net assets in cash. There is an increasing trend in the cash ratio over time (untabulated), confirming the growing importance to management of managing cash balances and its potential impact on firm performance and value. Another important variable is *MA*, which is DEA-based managerial ability as proposed by Demerjian *et al.* (2012). By construction, the raw value of *MA* has a mean (0.002) and median (0.009) close to 0, as this is the residual from the regression.

Table 2 reports the Pearson correlations for the variables in our main analysis. We find that managerial ability (*MA*) is positively correlated with a firm's cash holdings (*Cash*), consistent with Gan and Park (2017).

4.3. Contemporaneous Determinants of Cash Holdings

We initiate our empirical analysis with estimating the target cash ratios by regressing *Cash* on various factors that are known to determine the level of cash holdings of a firm. We use the predicted values from 17 yearly regressions of Equation (1) as

Table 1 Descriptive statistics

This table presents the descriptive statistics. Detailed definitions of the variables are provided in Appendix.

Variable	*N*	Mean	SD	P25	P50	P75
Cash	8503	0.079	0.084	0.021	0.052	0.108
MA	8503	0.550	0.275	0.300	0.500	0.800
MA (raw)	8503	0.002	0.105	−0.052	0.009	0.067
Size	8503	18.810	1.264	17.920	18.589	19.477
Tobin's Q	8503	1.068	0.495	0.768	0.932	1.199
Industry CF risk	8503	0.112	0.055	0.074	0.097	0.136
CFO	8503	0.019	0.085	0.004	0.031	0.061
WC	8503	0.099	0.192	−0.037	0.092	0.238
Capex	8503	0.020	0.050	−0.004	0.007	0.033
Leverage	8503	0.447	0.183	0.303	0.453	0.587
R&D	8503	0.025	0.036	0.002	0.011	0.032
Dividend	8503	0.650	0.477	0.000	1.000	1.000
Age	8503	13.812	9.659	6.000	11.000	19.000

Table 2 Correlation matrix

This table presents the Pearson correlation coefficients among the variables used in the analyses. Bold coefficients indicate the significance at 5% level. Detailed definitions of variables are provided in Appendix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) *Cash*	1.00												
(2) *MA*	**0.07**	1.00											
(3) *MA (raw)*	**0.06**	**0.92**	1.00										
(4) *Size*	**−0.11**	−0.00	0.02	1.00									
(5) *Tobin's Q*	**0.13**	**0.03**	0.01	**−0.07**	1.00								
(6) *Industry CF risk*	**0.12**	**0.03**	0.01	**−0.20**	**0.12**	1.00							
(7) *CFO*	**0.10**	**0.23**	**0.23**	**0.12**	−0.00	**−0.08**	1.00						
(8) *WC*	**0.12**	**0.14**	**0.11**	**−0.28**	0.02	**0.10**	**0.26**	1.00					
(9) *Capex*	−0.00	**0.05**	**0.04**	−0.01	**0.10**	−0.00	**0.10**	**−0.05**	1.00				
(10) *Leverage*	**−0.25**	**−0.09**	**−0.08**	**0.29**	−0.01	**−0.10**	**−0.28**	**−0.69**	**0.03**	1.00			
(11) *R&D*	**0.13**	−0.11	**−0.13**	**−0.20**	**0.24**	**0.17**	**−0.10**	**0.16**	**0.06**	**−0.18**	1.00		
(12) *Dividend*	−0.00	**0.15**	**0.14**	**0.23**	**−0.13**	**−0.18**	**0.44**	**0.21**	**0.06**	**−0.24**	**−0.16**	1.00	
(13) *Age*	**−0.13**	−0.00	−0.00	**0.45**	**−0.13**	**−0.17**	**−0.02**	**−0.18**	**−0.12**	**0.15**	**−0.22**	**0.08**	

a firm's target cash ratio to allow cash determinants and target ratios to vary over time. For ease of tabulation, we report the results for the Fama-MacBeth regression in Column (1) of Table 3. As alternative estimation, we also show the results of pooled regressions with year fixed effects, industry fixed effects, year/industry fixed effects, and firm/year fixed effects in Columns (2) through (5), respectively. The coefficients on the cash determinants are mostly stable across different estimation models.

As the determinants of cash holdings, we include firm size, Tobin's *Q*, industry cash flow risk, cash flow, net working capital, capital expenditure, leverage, R&D expenditures, a dividend dummy, and firm age (Opler *et al.*, 1999; Bates *et al.*, 2009; Dittmar and Duchin, 2011). The effects of the independent variables on cash holdings are generally consistent with prior studies. Firms retain more cash if they are small and/or young, have growth opportunities as measured by the Tobin's *Q* and R&D activity, and face high industry cash flow risk. Furthermore, firms with high net working capital, high leverage, and high capital expenditures have lower cash balances.

4.4. Managerial Ability and Cash Holding Adjustments

Hypothesis 1 investigates whether able managers exhibit slower or faster adjustment speed of cash holdings. To test, we interact the measure of managerial ability with the cash deviation from the target cash and run the regression model as in Equation (3), where the dependent variable is the adjustment in cash from last year to current year.

The results are reported in Table 4. In Column (1), the coefficient on the deviation from the target cash ratio is −0.366, indicating that the average firm's estimated adjustment speed for the cash ratio is 36.6% in each year. This implies that firms close a considerable portion of the gap between actual and target cash ratios in each year, indicating that managers actively consider the target ratios. More importantly, the coefficient on the interaction between target deviation and managerial ability is positive and significant. (0.118; *t*-value = 2.18). This indicates that higher managerial ability is negatively associated with adjustment speed of cash holdings. In other words, high-ability managers are, on average, slower in adjusting the cash holdings towards the target level. In terms of economic significance, the estimated adjustment speed for the cash ratio for firms with average ability managers in Column (2) is approximately 35.4%. The interquartile range change from low to high managerial ability results in slower cash adjustment by 5.9%. (i.e., 38.36–32.46%). Meanwhile, the coefficient on the standalone managerial ability is positive and significant (0.009; *t*-value = 3.03), showing that high-ability managers tend to retain cash holdings in the following years. In Column (3), we include squared cash deviation as an additional independent variable, since the adjustment speed may accelerate when the cash is further away from the target level (Jiang and Lie, 2016). Further, we include the interaction terms between cash deviation and year dummies to allow for the differential effects over time. After controlling for the above factors, the results remain consistent with Column (2).

Table 3 Contemporaneous determinants of cash holdings (first-stage regression)

This table reports determinants for optimal cash holdings. Detailed definitions of the variables are provided in Appendix. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively. *T*-statistics are computed based on standard errors clustered by firm.

Dep. Var.:		(1) FM	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) GMM
Intercept		0.186 (7.45)***	0.183 (9.18)***	0.171 (8.40)***	0.207 (9.75)***	0.165 (3.73)***	0.036 (0.71)	0.007 (0.14)	−0.288 (−4.64)***
Size	−	−0.006 (−5.04)***	−0.004 (−3.82)***	−0.003 (−3.15)***	−0.006 (−5.36)***	−0.002 (−0.62)	−0.069 (−3.61)***	−0.006 (−2.68)***	0.025 (7.17)***
Tobin's Q	+	0.018 (5.20)***	0.019 (10.51)***	0.022 (12.64)***	0.018 (10.31)***	0.016 (9.64)***	0.015 (4.97)***	0.011 (2.90)***	0.016 (8.89)***
Industry CF risk	+	0.096 (2.46)**	0.162 (6.51)***	0.064 (2.59)***	0.089 (3.22)***	0.012 (0.44)	0.148 (2.78)***	0.103 (1.83)*	0.016 (0.41)
CFO	−	0.044 (2.86)**	0.048 (5.85)***	0.051 (6.28)***	0.048 (5.97)***	0.041 (5.27)***	0.008 (0.44)	−0.004 (−0.20)	0.024 (3.50)***
WC	−	−0.003 (−0.04)	−0.058 (−7.42)***	−0.072 (−9.47)***	−0.065 (−8.63)***	−0.129 (−15.16)***	−0.000 (−0.01)	−0.003 (−0.25)	−0.262 (−34.81)***
Capex	−	−0.063 (−4.22)***	−0.058 (−4.47)***	−0.054 (−4.29)***	−0.053 (−4.13)***	−0.056 (−5.10)***	−0.049 (−2.75)***	−0.055 (−2.90)***	−0.088 (−6.83)***
Leverage	−	−0.093 (−8.51)***	−0.135 (−16.28)***	−0.154 (−18.62)***	−0.141 (−17.00)***	−0.157 (−16.45)***	−0.108 (−7.78)***	−0.077 (−5.47)***	−0.206 (−21.55)***
R&D	+	0.019 (0.76)	0.029 (1.04)	0.040 (1.43)	0.030 (1.07)	−0.055 (−1.40)	0.017 (0.42)	0.084 (2.00)**	−0.058 (−1.90)*
Dividend	−	−0.001 (−0.41)	0.000 (0.18)	−0.002 (−0.89)	0.001 (0.54)	0.010 (4.45)***	−0.008 (−2.00)**	−0.007 (−1.72)*	0.005 (2.10)**
Age	−	−0.001 (−9.10)***	−0.001 (−8.05)***	−0.001 (−6.32)***	−0.001 (−7.88)***	0.001 (3.97)***	−0.001 (−3.51)***	−0.001 (−3.30)***	−0.002 (−4.40)
MA							0.016 (3.23)***	0.026 (4.37)***	
Chaebol								0.005 (0.85)	
Industry effects		Yes	No	Yes	Yes	No	Yes	Yes	Yes
Firm effects		No	No	No	No	Yes	No	No	No
Year effects		No	Yes	No	Yes	Yes	Yes	Yes	Yes
Firm Clustering		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations		21 150	21 150	21 150	21 150	21 150	9753	6910	21 150
Adj. R^2		0.106	0.148	0.140	0.163	0.088	0.087	0.074	N/A

Table 4 The association between managerial ability and cash adjustment speeds

This table presents an analysis of the effect of managerial ability on cash adjustment speeds. Detailed definitions of the variables are provided in Appendix. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively. *T*-statistics are computed based on standard errors clustered by firm.

	(1)	(2)	(3)
Intercept	0.022 (1.45)	0.006 (0.37)*	0.024 (1.65)*
Deviation from target cash	−0.366 (−22.31)***	−0.419 (−12.34)***	−0.253 (−4.76)***
*Deviation from target cash * MA t−1*		0.118 (2.18)**	0.175 (3.24)***
MA t−1		0.009 (3.03)***	0.010 (3.48)***
Size	−0.000 (−0.11)	−0.001 (−0.82)	−0.001 (−1.81)*
Tobin's Q	0.002 (1.00)	0.002 (1.13)	0.002 (1.28)
Industry CF risk	0.040 (1.58)	0.026 (1.03)	0.034 (1.38)
CFO	0.053 (4.34)***	0.040 (3.24)***	0.039 (3.16)***
WC	−0.067 (−10.23)***	−0.051 (−7.56)***	−0.056 (−8.57)***
Capex	−0.059 (−6.24)***	−0.091 (−6.18)***	−0.089 (−6.14)***
Leverage	−0.051 (−6.98)***	−0.039 (−5.36)***	−0.048 (−6.66)***
R&D	−0.003 (−0.13)	0.002 (0.08)	0.008 (0.32)
Dividend	−0.000 (−0.05)	−0.001 (−0.51)	−0.001 (−0.37)
Age	0.000 (1.04)	0.000 (2.19)**	0.000 (1.59)
Deviation from target cash^2			−0.752 (−4.88)***
*Deviation * Year dummies*	No	No	Yes
Industry effects	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes
Observations	8503	8503	8503
Adj. R^2	0.188	0.190	0.205

In Table 5, we follow Jiang and Lie (2016) by estimating Equation (3) separately for firm-years with cash above versus below the target. This allows us to investigate whether the effect of managerial ability on adjustment speed is asymmetric, depending upon the magnitude of cash holdings compared to the target.

Columns (1) and (2) report the regression results when the cash ratio is below the target ratio, whereas Columns (3) and (4) report the results when the cash ratio is above the target. In Columns (2) and (4), we include squared cash deviation and the interaction terms between cash deviation and year dummies as additional control variables. The coefficient on the interaction between managerial ability and cash deviation is positive, but statistically insignificant for firm-years with cash holdings below the target (Columns (1) and (2)). In contrast, it is positive and significant for firm-years with cash levels above the target (Columns (3) and (4)). When the

Table 5 The association between managerial ability and cash adjustment speeds: the cash ratio below or above the target cash ratio

This table presents an analysis of the effect of managerial ability on cash adjustment speeds when the cash ratio is above (*Deviation from target cash* ≥ 0) and below (*Deviation from target cash* < 0). Detailed definitions of the variables are provided in Appendix. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively. *T*-statistics are computed based on standard errors clustered by firm.

	(1)	(2)	(3)	(4)
	Deviation < 0		*Deviation* ≥ 0	
Intercept	0.022 (1.51)	0.001 (0.08)	0.149 (5.01)***	0.103 (3.41)***
Deviation from target cash	−0.246 (−4.25)***	−0.411 (−3.39)***	−0.603 (−8.57)***	−0.529 (−4.46)***
*Deviation from target cash * MA t−1*	0.138 (1.56)	0.124 (1.42)	0.195 (1.75)*	0.242 (2.28)**
MA t−1	0.009 (1.82)*	0.008 (1.72)*	0.007 (0.91)	0.005 (0.65)
Deviation from target cash^2	No	Yes	No	Yes
*Deviation * Year dummies*	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes
Observations	5453	5453	3050	3050
Adj. R^2	0.041	0.043	0.2058	0.215

cash ratio is above the target cash ratio, the coefficient is 0.195 (t-value = 1.75) in Column (3) and 0.242 (t-value = 2.28) in Column (4). The results indicate that high-ability managers decelerate cash adjustments towards the target when cash levels are high, but not when cash levels are low.

Overall, the results in Tables 4 and 5 show that higher managerial ability is associated with lower adjustment speed of cash holdings towards the target level, particularly for firms having larger cash holdings than the target. Given that large cash holdings would draw the attention of shareholders and restrict managerial discretion (Harford *et al.*, 2008), our finding suggests that managers with higher ability are willing to share information about their large cash holdings.

4.5. The Role of Internal Capital Market

Hypothesis 2 examines the role of internal capital markets on the association between managerial ability and cash holding adjustments. We use affiliation with business group as the proxy of availability of the internal capital market. We estimate Equation (3) separately for the sample of firm-years that are affiliated versus not affiliated with a business group. Since we only have business group data from 2001 to 2011, the sample is reduced to 5660 firm-years. Among these observations, 12% have an affiliation with a business group, which we assume to have access to an internal capital market.

Table 6 presents the estimation results after partitioning the sample into unaffiliated and affiliated firms. The coefficient on *Deviation* has a larger magnitude for firms unaffiliated with a business group, indicating that cash holding adjustment speed is faster for unaffiliated firms than for affiliated firms (e.g., −0.407 in Column (1) versus −0.341 in Column (4)). More importantly, the existence of an internal market weakens the association between managerial ability and cash holding adjustments. Specifically, the coefficients on managerial ability interaction are positive and significant only when firm-years belong to an unaffiliated business group in Column (1) (0.182; t-value = 2.36). This result holds when we include squared cash deviation and the interactions between cash deviation and year dummies in Column (2) (0.218; t-value = 2.88). The interquartile range change from low managerial ability (25%) to high managerial ability (75%) results in slower cash adjustment by 9.1%. (i.e., 44.55–35.45%), indicating the economic significance of managerial ability in cash holding adjustment is large for firms unaffiliated with a business group. In contrast, the coefficients on the interactions are statistically insignificant in Columns (3) and (4) (−0.074; t-value = −0.49 and 0.034; t-value = 0.25, respectively). Thus, the relation between managerial ability and cash holding adjustment speed is weak for firms affiliated with a business group.

Similar with Table 5, for each subsample of firms with and without an affiliation with a business group, we divide the sample into two based on whether the cash ratio is below or above the target. In untabulated results, we find that the coefficient on managerial ability interaction variable is positive and significant only when the cash ratio is above the target and when the firms have no affiliation with

Table 6 The effect of *chaebol* on the association between managerial ability and cash adjustment speeds (data availability: 2000–2011)

This table presents an analysis of the effect of chaebol on the relation between managerial ability and cash adjustment speeds. Detailed definitions of the variables are provided in Appendix. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively. *T*-statistics are computed based on standard errors clustered by firm.

	(1)	(2)	(3)	(4)	(5)	(6)
	Non-chaebol			Chaebol		
Intercept	0.019 (0.78)	0.009 (0.40)	0.024 (1.03)	0.004 (0.07)	0.006 (0.10)	0.060 (1.04)
Deviation	−0.407 (−18.09)***	−0.491 (−9.81)***	−0.302 (−5.13)***	−0.341 (−6.79)***	−0.273 (−2.94)***	−0.004 (−0.02)
*Deviation * MA t−1*		0.182 (2.36)**	0.218 (2.88)***		−0.074 (−0.49)	0.034 (0.25)
MA t−1	0.015 (3.80)***	0.014 (3.47)***	0.016 (3.89)***	0.002 (0.21)	0.002 (0.21)	0.003 (0.38)
Deviation from target cash^2	No	No	Yes	No	No	Yes
*Deviation * Year dummies*	No	No	Yes	No	No	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4990	4990	4990	670	670	670
Adj. R^2	0.180	0.191	0.201	0.133	0.148	0.164

a business group. This indicates that able managers in the firms with no internal capital market do not immediately close the deviation from the target level of cash holdings, particularly when the cash ratio is above the target. We can infer from the results that able managers in the firms with no internal capital market show concern about the shortage of funding when it is in need for investments, whereas such a concern is less apparent for firms having an internal capital market through business group affiliation.

4.6. Investment Efficiency

Our findings above indicate that more able managers are likely to accumulate more cash holdings, compared to other managers in the absence of internal capital markets, by reducing the adjustment speed of cash holdings towards the target level. Possibly, large cash holdings enable shareholders to put pressure on managers to increase dividend payments and stock repurchases. If so, why are more able managers slower to reduce their firms' cash holdings to the level of other firms? Why are shareholders more patient with more able managers having larger cash holdings? One possible explanation is that high-ability managers stockpile cash to make timely and efficient investment decisions using large cash reserves. Although such an accumulation of cash holdings can attract attention from outside investors and a request for larger distribution to shareholders (Harford *et al.*, 2008), managers with higher ability would be in a better position to defend their cash holding decisions by pointing out their superior performance to their competitors.

Meanwhile, Jiang and Lie (2016) provide evidence that managers of entrenched firms are also less eager to disburse or spend cash in excess of the target levels. Thus, one may raise a concern that high-ability managers accumulate cash beyond the optimal level because they are risk-averse and want flexibility to pursue their personal interest. However, Jensen (1986) argues that such entrenched managers are inclined to invest cash inefficiently and even invest in negative net-present-value projects (i.e., overinvestment), thus a lower investment quality. Thus, the evidence of higher investment efficiency for firms with high-ability managers would mitigate the concern that high-ability managers are entrenched.

To verify this explanation, we construct a variable of abnormal investment by regressing 1-year ahead investments on Tobin's *Q*, operating cash flows, and sales growth (Biddle *et al.*, 2009). We denote the absolute value of residuals as |*Abnormal Invest*|, capturing the extent of abnormal investments. Then, we analyze whether excess cash accumulated by more able managers enhances investment efficiency, which is measured by the inverse of |*Abnormal Invest*|.

The results are reported in Table 7. In Column (1), where the dependent variable is |*Abnormal Invest*|, the coefficient on *Excess Cash* is positive and significant, indicating that, on average, firms holding cash that exceeds the optimal level are likely to make suboptimal investment decisions. However, the coefficient on the interaction between excess cash and managerial ability, *Excess Cash* * *MA*, is negative. This implies that firms with excess cash are less likely to make inefficient investments when they

are run by managers with high ability. This justifies our finding that firms with higher managerial ability are slower in reducing their cash holdings than firms with lower managerial ability because large cash holdings can be used to fund timely investments. To gain more understanding of whether high managerial ability reduces the relation between excess cash holdings and over- or under-investment, we partition the sample based on the sign of the raw value of *Abnormal Invest*. Columns (2) and (3) present the estimation results using positive and negative values of *Abnormal Invest* as the dependent variables, respectively. In Column (2), the coefficients on *Excess Cash* and *Excess Cash * MA* are positive and negative, respectively. However, those coefficients are statistically insignificant in Column (3). These results indicate that high managerial ability weakens the positive relation between excess cash and over-investment, whereas it does not have a significant effect on under-investment.

Table 7 The association between managerial ability, cash adjustment speed and investment efficiency

This table presents an analysis of the effect of managerial ability on cash adjustment speeds. Detailed definitions of the variables are provided in Appendix. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively. *T*-statistics are computed based on standard errors clustered by firm.

	(1)	(2)	(3)
Dependent variable	|Abnormal Invest|	Abnormal Invest > 0	Abnormal Invest < 0
Intercept	0.097 (3.35)***	0.145 (2.42)**	−0.075 (−2.83)***
Excess Cash	0.127 (2.58)**	0.249 (2.66)***	−0.027 (−0.73)
*Excess Cash * MA*	−0.133 (−1.92)*	−0.270 (−2.08)**	0.039 (0.73)
MA	0.018 (2.74)***	0.035 (2.57)**	−0.010 (−1.69)*
Size	−0.002 (−1.41)	−0.003 (−1.15)	0.001 (0.76)
BM	−0.007 (−5.00)***	−0.007 (−2.40)**	0.007 (4.74)***
CFO/Sales	0.042 (2.80)***	0.021 (0.66)	−0.057 (−4.11)***
Opercycle	−0.008 (−1.27)	−0.017 (−1.24)	0.008 (1.24)
Tangibility	0.046 (3.06)***	0.062 (1.96)*	−0.020 (−1.49)
Loss	0.001 (0.17)	0.001 (0.12)	−0.002 (−0.42)
Std_CFO	−0.020 (−0.90)	−0.024 (−0.56)	0.016 (0.82)
Std_Sales	−0.002 (−0.31)	−0.003 (−0.34)	0.001 (0.20)
Std_Investment	0.045 (2.35)**	0.064 (1.85)*	−0.013 (−0.86)
Firm age	−0.000 (−2.05)**	−0.000 (−0.90)	0.000 (0.39)
Dividend	−0.004 (−1.15)	0.003 (0.42)	0.008 (2.56)**
Zscore	0.005 (1.41)	−0.001 (−0.10)	−0.010 (−2.76)***
Sales Growth	0.007 (1.42)	−0.001 (−0.10)	−0.015 (−2.57)**
Industry effects	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes
Observations	2382	951	1431
Adj. R^2	0.088	0.062	0.157

4.7. Robustness Test

4.7.1. Different Estimation Methods.

In this section, we conduct several alternative estimation methods to compute the target cash ratio. First, we use a panel regression with year fixed effects, industry fixed effects, year/industry fixed effects, and firm/year fixed effects. We present the first stage regression results in Columns (2)–(5) of Table 3, respectively. Using the above pooled regressions to estimate the target level of cash holdings does not change our main inference. Second, we include managerial ability in the first-stage regression, because high-ability managers are likely to make better use of cash and, thus, hold more cash (Gan and Park, 2017). Column (6) of Table 3 shows that there is a positive relation between managerial ability and cash holdings. In Column (7), we also control for the existence of internal capital markets, which is proxied by *Chaebol*. When we include both managerial ability and *Chaebol* in the first stage in Column (7) of Table 3, we still find that the level of cash holdings is positively associated with managerial ability while the coefficient on *Chaebol* is insignificant. We use either Column (6) or (7) to estimate the target level of cash and reanalyze our main test. We find that our findings remain intact. Lastly, we use a dynamic regression with Generalized Method of Moments (GMM) methods to estimate the target cash ratio (Flannery and Hankins, 2013). We find consistent estimation results for cash holding adjustments when we use the estimated target cash holdings from GMM estimation.

5. Conclusion

We investigate the relation between managerial ability and cash holding dynamics, focusing on the adjustment speed of cash holdings. Using a large sample of Korean-listed firms during 2000–2016, we find that higher managerial ability is associated with slower cash holding adjustment towards the target level. We also find that the existence of internal capital market, proxied by an affiliation with business group, alleviates the relation between managerial ability and cash holding adjustments. Lastly, we find that firms with excess cash are less likely make over-investments when they are run by high-ability managers. This result suggests that more able managers are more likely to hold excess cash to make efficient investments, yielding slower cash holding adjustment speed.

This paper contributes to the literature by presenting that managerial ability can be the determinant of cash holding dynamics. Particularly, we show that high-ability managers with excess cash are less likely to reduce cash holding and engage in efficient investment decisions. These findings explain why the value of cash holdings should be higher for firms with high-ability managers (Gan and Park, 2017). This study also provides new evidence on the effect of internal capital markets on cash holding adjustment. Internal capital markets within business groups alleviate firms' incentives to accumulate cash holdings because it allows the allocation of cash holdings through internal transactions from cash-generating business units to cash-

spending business units. Furthermore, we find that internal capital markets alleviate the incentive to accumulate cash holdings even when the firm is run by managers with high ability. This finding implies that firms with internal capital markets are less likely to close the gap between actual and target cash ratios.

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Appendix
Variable Definition

Variables	Definition
Cash	Cash and cash equivalents scaled by total assets minus cash and cash equivalents
Deviation from target cash	The difference between the *Cash* and the target cash ratio, which is estimated by the predicted value from annual regression of Equation (1)
MA (raw)	MA-Score, which is managerial efficiency from Demerjian *et al.* (2012)
MA	The annual decile rank of the *MA (raw)*

Appendix (*Continued*)

Variables	Definition
Size	The natural log of total assets (Book value of total assets – book value of equity + market value of equity) scaled by the book value of total assets
Tobin's Q	
Industry CF risk	The mean of the standard deviation of cash flow scaled by total assets over 10 years for firms in the same industry, as defined by the two-digit KSIC code
CFO	(EBITDA – interest – taxes – common dividends) scaled by total assets
WC	Net working capital minus cash and equivalents scaled by total assets
Capex	Capital expenditures scaled by total assets
Leverage	Total debt scaled by total assets
R&D	R&D expenditures scaled by sales revenue
Dividend	A dummy variable that equals to 1 if the firm paid a common dividend in that year, and zero if it did not
Age	The difference between the IPO year and the current year
Chaebol	A dummy variable that equals to 1 if the firm belongs to one of the business conglomerates known as chaebols, and 0 otherwise. We obtain the list of firms affiliated with chaebols from the Korea Fair Trade Commissions (KFTC). The KFTC defines a chaebol as a group of companies in which more than 30% of the shares are owned by the group's controlling shareholders and their affiliated companies

Variables on the analysis of investment efficiency

Abnormal Invest	The residuals from the regression of investments on the 1-year lagged values of Tobin's *Q*, CFO/TA and sales growth. Investment is defined as (capital expenditures + R&D expenditures + acquisitions – sales of PPE) scaled by lagged total assets. Tobin's *Q* is defined as (book value of total assets – book value of equity + market value of equity) scaled by the book value of total assets. CFO/TA is the ratio of operating cash flows scaled by lagged total assets. Sales growth is the annual change in sales scaled by lagged sales
Excess Cash	The difference between the cash ratio (= cash/net total assets) and the target cash ratio when the cash ratio is above the target cash ratio
Size	The natural log of total assets
BM	Book value of equity to the market value of equity
CFO/Sales	Operating cash flows scaled by sales revenue
Opercycle	Average account receivables (scaled by sales) + average inventory (scaled by costs of goods sold)
Tangibility	PPE scaled by total assets
Loss	A dummy variable that equals to 1 if net income is negative, and 0 otherwise

Appendix (*Continued*)

Variables	Definition
Std_CFO	Standard deviation of operating cash flows scaled by lagged total assets for years $t-3$ to $t-1$
Std_Sales	Standard deviation of the sales scaled by lagged total assets for years $t-3$ to $t-1$
Std_Investment	Standard deviation of *Investment* scaled by lagged total assets for year $t-3$ to $t-1$ where *Investment* is defined as (capital expenditure + R&D expenditures + acquisitions – sales of PPE) scaled by lagged total assets
Firm age	The difference between the IPO year and the current year
Dividend	A dummy variable that equals to 1 if the firm paid dividend, and 0 otherwise
Zscore	A dummy variable that equals to 1 if the Altman's (1968) *Z*-score is below 1.81, and 0 otherwise. Altman's (1968) *Z*-scored is computed using the following formula: $Z = 1.2$ * (working capital/total assets) + 1.4 * (retained earnings/total assets) + 3.3 * (earnings before interests and taxes/total assets) + 0.6 * (market value of equity/book value of total debt) + 1.0 * (sales/total assets)
Sales Growth	The annual change in sales scaled by lagged sales