Does Managerial Ability Improve Value of Cash Holdings?

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Abstract

This paper investigates whether managerial ability is associated with value of cash holdings. Using the approach of Faulkender and Wang (2006), I find that the marginal value of cash increases with firm managerial ability. The results are robust to controlling for potential omitted variables. Furthermore, I find the enhancing effect of managerial ability on cash value is more pronounced for firms with higher growth opportunities and multiple business segments. Additionally, I find that firms with high-ability managers would use cash resources to achieve higher subsequent operating performance. It suggests high-ability managers would spend money in the best possible way rather than wasting cash.

Keywords: Value of cash; Managerial ability

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1. Introduction

Managerial ability has been argued to be the most important facet of human resources affecting firm value in both practice and theory (Gaines-Ross 2003). A practitioner survey from Burson-Marsteller shows that most financial analysts would recommend a company's stock based on CEO reputation because a CEO with a well-established reputation, believed to have high ability, will sustain good performance or turn around poor performance. Meanwhile, there are an increasing number of studies that have examined the role of managerial ability on firm value and other issues. High ability managers may have reputations for being skilled operators and decision makers. Fahy and Smithee (1999) also argue that managerial ability is valuable and non-substitutable because managers are responsible for identifying, developing and deploying the firm's resources to maximize shareholder value. Recently, Agarwal et al. (2007) provide evidence that better management ability is associated with higher market value demonstrating its value relevance.

Cash typically constitutes an important component of a firm's assets. For example, Bates et al. (2009) show that U.S. industrial firms have increased their cash holdings from 10.5% in 1980 to 23.2% in 2006. Liquid assets require an effective management system because they are exposed to high misallocation and wasting risk. Harford (1999) and Dittmar et al. (2003) find that cash hoarding by firms is value-reducing and can be a result of agency problems inside corporations, while Mikkelson and Partch (2003) argue that a policy of high cash holdings is not necessarily value-reducing and may in fact be an operating necessity. Although accounting and finance literature emphasize the governance mechanism for cash assets, little is known about the impact of managerial characteristics on cash management. In this paper, I seek to link the two strands of literature by examining the role of managerial ability on corporate liquidity policies.

Specifically speaking, my first objective is to test how managerial ability affects the balance of corporate cash holdings. Previous studies (e.g., Chemmanur et al., 2004; Francis et al., (2008) suggest that firms of higher management ability can access external financing more easily with more favorable terms. However, I

conjecture that high-ability managers of firms may still have an incentive to maintain large cash reserves. Because managers with higher ability can obtain more precise information on investment opportunities, make better investment choices and achieve successful project outcomes with greater likelihood, they therefore have incentives of holding more cash in response to growth opportunities and investment needs. On the other hand, outside shareholders should allow well-managed firms to holding sufficient cash particularly when they believe that their managers will serves the shareholders' interests. Therefore, I predict a positive association between managerial ability and cash holdings.

Second, I examine whether managerial ability impacts a firm's efficiency in appropriating cash resources for shareholders' wealth. In the presence of asymmetric information, corporate cash holding contributes to firm value by alleviating the underinvestment problem when external financing is costly. However, since it is the most liquid among all corporate assets, cash also provides managers with the most latitude as to how and when to spend it, and its value is the most likely to be influenced by managerial characteristics. In other words, a dollar of corporate cash holding may not be worth a dollar to outside shareholders, since poor-quality managers may waste part or all of it by empire-building, over-investing in negative net present value projects and/or diversifying into unprofitable businesses. If investors regard managerial ability as an indication of successful project outcomes, I can expect them to put a larger pricing-weight on the cash resources of firms with higher management ability.

Overall, this study provides several contributions to the literature on managerial ability and corporate liquidity policies. First, whether managers with greater ability have the incentive to accumulate more cash reserves is an interesting empirical question that has not been examined previously. This study is intended to fill this gap by documenting that managerial ability is positively and significantly associated with cash holdings. Second, this paper contributes to the growing literature on the value implication of cash holdings. My expected findings also shed light on how managerial ability improves cash management and eventually enhances firm value. Third, contribution of this paper is to understand whether managerial ability is valuable to firms as an intangible asset.

The remainder of the paper proceeds as follows. Section 2 reviews the relevant literature and formally develops hypotheses on the relation between managerial ability and cash holdings as well as the value implications of the two. Section 3 presents my research design and describes our sample and main variables. Section 4 reports the results of my two hypotheses and provides robustness tests which examine the managerial ability have positive effect on the value of cash. Section 6 concludes the paper.

2. Related Literature and Hypotheses

2.1 The importance of managerial ability

Managerial ability is clearly an important ingredient in the success of a business. Hall (1992) shows that highly-reputed CEOs have the abilities to make strategic investments that increase firm value. Chemmanur and Paeglis (2005) empirically examine the relationship between the firm's management quality and IPO characteristics or post-IPO performance. They find that superior management quality results in larger IPO offer size, reduces IPO underpricing and increases post-IPO long-term stock returns and operating performance. For firms that issue stock following the IPO, management quality affects the firm's financial policies, SEO characteristics, and post-SEO performance (Chemmanur, Paetlis, and Simonyan, 2010). Recently, Chemmanur et al. (2009) document that higher management quality is associated with value-increasing projects since managers with higher quality would select better projects represented by superior net present value (NPV) and to implement them more ably.

The ability of firm management may be able to certify their firm value and quality more credibly to outsiders. In the practitioner arena, Gaines-Ross (2002) and a leading consulting firm, Burson-Marstellar (2003), show that CEO quality has a significant influence on financial analysts' stock recommendations and investors' stock purchase decisions. Chemmanur and Paeglis (2005) provide evidence that the higher level of management ability attracts more reputable underwriters and institutional investors when firms issue equity. Agarwal et al. (2008) find that large corporations in the United Kingdom with better quality

management are better insulated from industry- and economy-wide factors, and hence have more stable earnings and less risky cash flows, leading to a lower cost of capital. In sum, the evidence suggests that market participants may be influenced by the presence of high-quality managers in a firm because they trust the ability of managers to discern firm quality and viability as a result of their business expertise.

Trueman (1986) argues that quality managers have an incentive to provide voluntary disclosure to reveal their type and reduce the information asymmetry problem. In consistent with this theory, Baik et al. (2012) find that higher ability managers are more likely than low ability managers to issue management forecasts to signal their ability, thereby increasing the quality of information. Koh (2010) demonstrate that award winning CEOs are less likely to undertake opportunistic earnings management for short-term earnings target. Baik et al. (2010) find that CEOs with high reputations have incentives to protect their reputations by increasing the flow of information to the market, thereby decreasing opacity. Also, Chemmanur et al. (2009) indicate that firms with better managements do indeed face a lower extent of information asymmetry and exhibit a greater liquidity of their shares.

2.2 The level and market valuation of cash holdings

Corporation cash produces lower transaction costs when firms face a payment and a buffer to solve unexpected events, so it is important to determine the level of holding cash. Opler, Pinkowitz, Stulz and Williamson (1999) focus on the determinants of the optimal level of corporate cash reserves, they find a tradeoff model which the level of cash is optimal when the marginal benefit of holding additional cash equal to the marginal cost. Based on the precautionary motive, firms tend to hold cash for unexpected events requiring sudden outlay and for unforeseen opportunities of advantageous purchases. Several studies support the precautionary savings, for examples, Rettl (2011) reports that firms having better investment opportunities increase their cash holdings. D'Mello, Krishnaswami, and Larkin (2008) document that cash holdings are lower when firms with greater access to internal sources. They also report that firms with growth opportunities are allocated more cash. Bates et al (2009) find that firms'

riskier cash flows and R&D intensity lead to cash-to-assets ratios increase. Han and Qiu (2007) report that higher levels of risk are related to higher levels of cash reserves, and it is much stronger for financially constrained firms. They report that firms with better investment opportunities, riskier cash flows and poor access to external capital hold more cash.

After determining the optimal level of cash reserve, the action to assess the economic value of the liquid assets is launched. The value of one dollar cash holdings may become 0.8 dollar, so we want to know why the value of cash holdings decreases and how to increase it. Because the financially constrained firms are difficult to fund, the value of cash holdings rests on having more hoarding cash to profitable investments. Denis and Sibikov (2010) document that value of cash holdings is higher for financially constrained firms with rich investment opportunities. Faulkender and Wang (2006) argue that firms with greater financing constraints have more marginal value of cash. Almeida, Campello and Weisbach (2004) report that the value of cash increases for constrained firms.

A fair large body of work is focused on the agency problems when investigating the value of cash. Some literatures indicate marginal value of cash will higher through corporate governance. For example, Dittmar and Mahrt-Smith (2007) show that better corporate governance doubles the value of cash than poor corporate governance. Pinkowitz, Stulz, and Willamson (2006) report that the value of cash is much higher in countries with better investor protection than in other countries. Diversified firm would deteriorate the agency problems, so Tong (2011) report that the value of cash holdings decreases in diversified firms, comparing with single-segment firms. He documents that the relation between firm diversification and the value of cash is much lower among the firms with lower level of corporate governance.

Another factor which has impact on value of cash holdings is information asymmetries. Drobetz, Gruninger, and Hirschvogl (2010) provide evidence to support free cash flow theory and report the value of cash in states with a lower degree of information asymmetry is higher than in states with a higher degree of information asymmetry. Based on free cash flow theory, managers are free to decide on investments according to their own discretion, and they prefer to

invest even the projects without positive net present value instead of paying out funds. Therefore, corporate governance mechanisms are supposed to limit managers' self-serving behavior. But the information asymmetry disturbs firm outsiders to distinguish between bad and good investments. Lankinen (2011) reports that information asymmetry decreases the value of cash holdings for firms with low investment opportunities because managers may waste cash in value-destroying projects for firms without high growth opportunities.

2.3 Empirical hypotheses

Managers of higher ability should be attuned to identifying the opportunity set of the firm in its deployment of resources to their most efficient uses. Also, high-ability managers have more to lose, in terms of reputation and future compensation, if their firms systematically invest in negative NPV projects. Managers with higher ability therefore should use firm resources to achieve successful project outcomes with greater likelihood. Given high-ability managers have the abilities and incentives to allocate efficiently resources within the company, which should be increasing market valuation of cash reserves, as cash resources are better aligned with investment opportunities. In addition, management quality helps reduce information asymmetry between firms and outside investors. Chemmanur and Paeglis (2005) indicate that the higher level of management quality attracts more participation and higher levels of holdings by institutional investors, thereby inducing strong institutional monitoring. The monitoring effort from outside investors with large holdings also can positively affect investment efficiency of cash resources. The above discussions lead to my first hypothesis stated as follows

Hypothesis 1: The value of cash holdings increases in firms with high managerial ability.

According to Chemmanur and Paeglis (2005), managers with better performance may be able to select positive NPV projects, indicating a larger equilibrium scale of investment. In this case, large cash holdings allow those well-managed firms to make more investment choices, such as R&D and capital

expenditure, and to achieve more successful project outcomes. Therefore, high quality managers are predicted to hold higher cash balances. Shareholders, on the other hand, might have a similar perspective on the firms' cash holdings. If outside shareholders consider that the amount of cash holdings might be value enhancing because higher cash holdings can make a firm of high management quality less likely to give up valuable investment opportunities, then I should expect a positive relationship between cash holdings and managerial ability. The above discussions lead to my second hypothesis.

Hypothesis 2: Firms of higher managerial ability hold more cash reserves.

3. Data and Research Design

3.1 Sample Selection

Our initial sample consists of 31,574 firm-year observations with a CEO name from the EXECUCOMP database. We first match these firms to Compustat and the Center for Research in Security Prices (CRSP) to retrieve the Standard Industrial Classification (SIC) codes, accounting information, and return data. We eliminate the observations with missing control variables. Following Faulkender and Wang (2006), we exclude financial firms (SIC codes 6000-6999) and utility firms (SIC codes 4900-4999) and firm-years for which total noncash assets are negative. This selection process results in a final sample of 19,451 observations (2,282 firms) across 37 industries as defined as by Fama and French (1997) from 1992 to 2010. Table 1 gives the sample selection reconciliation. Finally, when we measure CEO ability by employing managerial efficiency and industry-adjusted ROA (discussed later), we further delete observations with insufficient data to estimate these variables.

3.2 Measures of managerial ability

Managerial ability is difficult to measure because it is multi-dimensional. Following Baik et al. (2010), I would like to identify four proxies which capture the market's assessment of the managerial ability and are used in previous literature. The four proxies to measure managerial ability are introduced as

below.

Following Milbourn (2003), Francis et al. (2008) and Demerjian et al. (2012), the first one is press citations. When a CEO is assessed as an expert, he is more likely to be interviewed and cited. The proxy is measured by hand-collect news articles which the name of a manager is mentioned from of publications in the Factiva database. A manager maybe builds his/her reputation during a period of time, but Francis et al. (2008) find that the single and multi-year measures are positive-related significantly. Therefore, yearly citations can represent accumulated managerial reputation. I use the number of press citations single year to measure managerial ability. In addition, not all assessments of managers in the articles are positive, so Baik et al. (2011) perform a validation test. They verify that 94% of articles for CEOs are neutral or positive tones.

I adopt the second one from Demerjian et al. (2012), who use data envelope analysis (DEA) to measure manager-specific ability. DEA has been viewed as the manager's performance and managerial efficiency. A DEA model combines multiple inputs and outputs and be defined as ratio of weighted outputs to weighted inputs. Demerjian et al. (2012) regress the firm-level measure on market share, size, the number of firm segments and foreign operations, and firm fixed effects. And the residual produced from the regression is the proxy of managerial ability. They use sales as output, and cost of goods sold, selling and administrative expenses, net property, plant and equipment (PP&E), net operating leases, net research and development, purchased goodwill, and other intangible assets as seven inputs. The value of efficiency measure that DEA creates can be between zero and one. When the value is one, it means observations are most efficient. Managers of better ability can carry out superior business processes to create a higher rate of output from given inputs.

Following Rajgopal et al. (2006), the third one is industry-adjusted ROA for the prior three years for a particular CEO for each firm-year. The measurement is defined as income before extraordinary items divided by average total assets for each firm, and then the all subtract the average ROA for firms with the same two-digit SIC code for each firm-year. If the amount of firms within the same two-digit SIC code for a given year is less than 10, I deleted observations. In order to isolate the effect of economical environment, the average ROA with the same

industry is subtracted from ROA for each firm.

Following Francis et al. (2008), I use managerial awards from business journals as the last measure of managerial reputation. I collected managerial award data from the major U.S. newspapers including Wall Street Journal (both weekday and Sunday editions), New York Times, Washington Post, and USA Today and the major international newspapers like the Financial Times, Asian Wall Street Journal, Wall Street Journal Europe, and International Herald Tribune. The managers getting awards from these business magazines have become highly reputed in the business community. If the CEO was given any award for the last five years, I set the award variable equal to 1 or 0 if not.

3.3 Valuation of Cash Tests

In order to investigate the impact of managerial ability on the value of cash holdings, I follow Faulkender and Wang (2006)'s methods and augment to include indices of managerial ability. The model is specified as following:

$$r_{i,t} - R_{i,t}^{B} = \gamma_0 + \gamma_1 \frac{\Delta CASH_{i,t}}{M_{i,t-1}} + \gamma_2 \frac{\Delta EARN_{i,t}}{M_{i,t-1}} + \gamma_3 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_4 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \gamma_5 \frac{\Delta INT_{i,t}}{M_{i,t-1}}$$
$$+ \gamma_6 \frac{\Delta DIV_{i,t}}{M_{i,t-1}} + \gamma_7 \frac{\Delta CASH_{i,t-1}}{M_{i,t-1}} + \gamma_8 LEV_{i,t} + \gamma_9 \frac{NF_{i,t}}{M_{i,t-1}} + \gamma_{10} \frac{CASH_{i,t-1}}{M_{i,t-1}} \times \frac{\Delta CASH_{i,t}}{M_{i,t-1}}$$
$$+ \gamma_{11} LEV_{i,t} \times \frac{\Delta CASH_{i,t}}{M_{i,t-1}} + \gamma_{12} ABILITY_{i,t} + \gamma_{13} ABILITY_{i,t} \times \frac{\Delta CASH_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t} \quad (1)$$

where the term ΔX indicates the changes in the variable X for firm i from the prior year to the specified year; $r_{i,t}$ is the stock return for firm i over fiscal year t-1 to t; $R_{i,t}^{B}$ is stock i's benchmark return over fiscal year t-1 to t; $CASH_{i,t}$ is the cash holdings of firm i at time t; $EARN_{i,t}$ is the earnings before interest and extraordinary items of firm i at time t, and it is consisted of earnings before interest and extraordinary, interest, deferred tax credits, and investment tax credits; $NA_{i,t}$ is the net assets of firm i at time t, and it is computed by total asset minus cash; $RD_{i,t}$ is the R&D expenditures of firm i at time t and it is zero if missing; $INT_{i,t}$ is the interest expense of firm i at time t; $DIV_{i,t}$ is the common dividends of firm i at time t; $LEV_{i,t}$ is market leverage of firm i at time t, that is total debit divided by total debit plus market value of equity; $NF_{i,t}$ is net financing which is calculated as equity issuance minus repurchases plus debt issuance

minus debt redemption of firm i at time t; $M_{i,t-1}$ is market value of equity of firm i at time t-1.

The dependent variable is the abnormal return over the fiscal year. The model is based on a long-term event study which net present value of the event is estimated by the unexpected change of returns and the event window is defined to be the fiscal year. The specification of abnormal return controls for firm-specific factors that may be correlated with both cash holdings and returns other than cash. To calculate stock's value-weighted benchmark return, we use 25 Fama and French portfolios based on size and book-to-market. For each fiscal year, we classify every firm into one of 25 portfolios based on the intersection between the size and book-to-market.

I add an interaction $ABILITY_{i,t} \times \frac{\Delta CASH_{i,t}}{M_{i,t-1}}$ to test the previous hypotheses. The coefficient of the interaction term indicates the impact of managerial ability on the marginal value of cash holdings. I also add the ABILITY index in the regression to confirm that the estimated coefficient of the interaction term is due to the interaction, and not due to managerial ability itself. To reduce the impact of outliers, I winsorize the data at 1% and 99% level. Following Faulkender and Wang (2006), I include change in cash holdings, firm's profitability, financing policy, and investment policy as control variables in the regression. I control for changes in the firm's profitability using earnings before interest and extraordinary items ($EARN_{i,t}$) and changes in the investment policy using total assets net of cash ($NA_{i,t}$) and R&D expenditures ($RD_{i,t}$). The variables of financing policy include the cash holdings of firm i at time t ($CASH_{i,t}$), interest expense ($INT_{i,t}$), common dividends ($D_{i,t}$), market leverage at the end of fiscal year t ($LEV_{i,t}$), and the firm's net financing during the fiscal year t ($NF_{i,t}$). I expect that an extra dollar of cash will increase value of cash holdings if the manager has good ability. That is, I expect a positive coefficient on the interaction between cash and managerial ability.

3.4 Level of Cash Tests

Following Opler et al. (1999), the model is specified as following:

$$CASH_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 MB_{i,t} + \beta_3 CF_{i,t} + \beta_4 NWC_{i,t} + \beta_5 BLEV_{i,t} + \beta_6 IND\_SIGMA + \beta_7 D\_DUM_{i,t} + \beta_8 RD_{i,t} + \beta_9 CAPEX_{i,t} + \beta_{10} REG\_DUM_{i,t} + \beta_{11} ABILITY_{i,t} + \varepsilon_{i,t} \quad (2)$$

where the dependent variable, $CASH_{i,t}$, is the natural logarithm of cash to net assets for firm i at time t. It is calculated as cash divided by assets less cash holdings; $SIZE_{i,t}$ is define as the natural logarithm of net assets for firm i at time t as the proxy for firm size, and be deflated using the CPI to 1994 dollars; $MB_{i,t}$ is a ratio calculated by the book value of assets minus the book value of equity plus the market value of equity for firm i at time t as the numerator, and the book value of net asset for firm i at time t as the denominator; $CF_{i,t}$ is a ratio which cash flow for firm i at time t as the numerator, and total asset less cash holdings as the denominator. Cash flow is defined as operating income before depreciation and amortization minus interest minus taxes minus common dividends. Firms with higher cash flow hoard more cash and might have better investment opportunities; $NWC_{i,t}$ is a ratio which net working capital for firm i at time t as the numerator, and total asset less cash holdings as the denominator. Net working capital is measured by current assets minus cash minus current liabilities, so it can also be defined as other liquid assets which substitute cash holdings; $BLEV_{i,t}$ is calculated as total debt divided by total assets for firm i at time t. Total debt is consisted of short-term debt and Long-term debt. When firms do not have sufficient resources, they would raise debt. Therefore, firms with higher leverage have lower cash holdings; *IND_SIGMA* is industry Sigma. It is the mean of standard deviations of cash flow over assets over 20 years, for firms in the same industry which haves the same 2-digit SIC code; $D\_DUM_{i,t}$ is Dividend Dummy for firm i at time t. Dividend dummy variable equals to one if the firm paid a common dividend in the year and zero if not. Firms paying dividends are likely to be less risky, so the level of cash holdings is lower; $RD_{i,t}$ is a ratio which research and development expense for firm i at time t as the numerator, and sales as the denominator. R&D is equal to zero when it is missing. Firms with higher R&D are likely to have greater costs of financial distress and growth opportunities. So, it could be a positive relation between the cash ratio and R&D; $CAPEX_{i,t}$ is a ratio which capital expenditure for firm i at time t as the

numerator, and total asset less cash holdings as the denominator; $REG\_DUM_{i,t}$ is Regulation dummy for firm i at time t. Regulation dummy equals to one if the firm is in a regulated industry for the year, and equals to 0 if it is not. Regulated industries include railroads (SIC code 4011) through 1980, trucking (SIC codes 4210, 4213) through 1980, airlines (SIC code 4512) through 1978, and telecommunications (SIC codes 4812, 4813) through 1982. The variable of our interest, $ABILITY_{i,t}$, represents managerial ability and I expect its coefficient to be positive based on our first hypothesis.

Table 1 Sample selection reconciliation

Sample selection process	Firm-year observations
Firm-year observations in EXECUCOMP with CEO names from 1992 to 2010	31,574
Match to Compustat to obtain accounting data	25,845
Match to CRSP to obtain stock return data	23,969
Delete firms in financial and utility industries (SIC codes 4900-4999 and 6000-6999)	19,452
Delete firm-year observations with negative total noncash assets	19,451
Final sample	19,451

4. Empirical Results

4.1 Descriptive statistics

Table 2 presents descriptive statistics for all the variables used in our analyses. The distribution of abnormal return (*ABRET*) is slightly skewed to the right, mean of 3.1% greater than median of -2.5%, with no great outliers. The mean number of press citations is near 3 citations and about 9% of CEOs received an award in the past five years. All independent variables except *LEV* are presented as a percentage of the lagged market value of equity. In general, the distributional characteristics of our variables are comparable to those reported in earlier research (e.g., Faulkender and Wang, 2006; Tong, 2011; Louis et al., 2012). The mean (median) change in cash holdings is 1.3% (0.4%) of the market value of equity; this implies that, on average, firms have been increasing their cash holdings over time. In terms of market leverage (*LEV*), the mean (median) value is 0.11 (0.06), with a standard deviation of 0.14. The mean and

median of net financing (*NF*) are 0.194 and 0.151, respectively. The means of the change in R&D, change in interest expense, and change in dividend payout are near zero, which suggests that these variables appear to be quite stable over time.

Table 2 Descriptive statistics

This Table provides descriptive statistics for the variables used in my analysis of value of cash associated with managerial ability from 1992-2010. It provides mean, standard deviation, 25th percentile, median and 75th percentile. The variables definitions and calculations are shown in Appendix A.

Variable	Observations	Mean	Std. Dev.	Q1	Median	Q3
Dependent variable						
$ABRET_t$	19,451	0.031	0.460	-0.244	-0.025	0.218
Managerial ability proxies						
$AWARD_t$	19,451	0.086	0.280	0.000	0.000	0.000
$CITATION_t$	19,451	2.929	13.353	0.000	0.000	1.000
DEA_Score_t	14,987	-0.035	0.146	-0.114	-0.032	0.030
$IndAdjROA_t$	15,417	0.054	0.115	0.005	0.042	0.094
Independent variables						
$\Delta CASH_t$	19,451	0.013	0.082	-0.012	0.004	0.031
$\Delta EARN_t$	19,451	0.011	0.131	-0.014	0.008	0.029
ΔNA_t	19,451	0.062	0.258	-0.012	0.040	0.120
$\Delta R\&D_t$	19,451	0.001	0.012	0.000	0.000	0.002
ΔINT_t	19,451	0.001	0.011	-0.001	0.000	0.003
ΔDIV_t	19,451	0.000	0.005	0.000	0.000	0.001
LEV_t	19,451	0.107	0.142	0.022	0.059	0.136
NF_t	19,451	0.194	0.183	0.041	0.151	0.292
$CASH_{t-1}$	19,451	0.107	0.142	0.022	0.059	0.136

4.2 Managerial ability and cash valuation

4.2.1 Return regressions

Our primary objective is to measure the impact of managerial ability on the value of cash holdings. We estimate four separate models, one for each measure of managerial ability. The results of the regression analysis are shown in Table 3. The focus of this table is on the regression coefficient of $ABILITY_t * \Delta CASH_t$. The results in model (1) to model (4) show that all of four ability variables exhibit positive and significant coefficients, suggesting that the value of an additional dollar in holdings increases in managerial ability. Thus, consistent with the efficient investment hypothesis, this evidence supports the view that high-ability managers are associated with a more efficient use of cash holdings.

Table 3 The effect of CEO ability on the association between change in market value and change in cash holdings

Table 3 presents fixed-effects regressions in Eq. (1) under all four proxies of CEO ability,. The definitions of the variables are presented in Appendix A. I use ***, **, and * to indicate significance at the 1%, 5%, and 10% levels, respectively. P-Values are given in brackets.

Dependent variable: $ABRET_t$				
	Managerial ability (*ABILITY*) proxies =			
Variables	*AWARD*	*CITATION*	*DEA_Score*	*IndAdjROA*
$\Delta CASH_t$	2.121***	2.143***	2.244***	1.980***
	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta EARN_t$	0.530***	0.531***	0.557***	0.569***
	[0.000]	[0.000]	[0.000]	[0.000]
ΔNA_t	0.321***	0.322***	0.326***	0.314***
	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta R\&D_t$	0.593**	0.589**	0.809***	0.430
	[0.025]	[0.026]	[0.007]	[0.155]
ΔINT_t	-2.479***	-2.481***	-3.008***	-2.456***
	[0.000]	[0.000]	[0.000]	[0.000]
ΔDIV_t	0.565	0.560	0.103	0.670
	[0.398]	[0.403]	[0.890]	[0.360]
$CASH_{t-1}$	0.441***	0.444***	0.436***	0.389***
	[0.000]	[0.000]	[0.000]	[0.000]
LEV_t	-0.560***	-0.559***	-0.532***	-0.531***
	[0.000]	[0.000]	[0.000]	[0.000]
NF_t	-0.234***	-0.233***	-0.254***	-0.269***
	[0.000]	[0.000]	[0.000]	[0.000]
$CASH_{t-1} * \Delta CASH_t$	-0.410***	-0.443***	-0.793***	-0.472***
	[0.003]	[0.001]	[0.000]	[0.003]
$LEV_t * \Delta CASH_t$	-2.453***	-2.491***	-2.559***	-2.223***
	[0.000]	[0.000]	[0.000]	[0.000]
$ABILITY_t$	-0.022**	-0.000	0.103***	-0.028
	[0.046]	[0.490]	[0.000]	[0.391]
$ABILITY_t * \Delta CASH_t$	0.622***	0.010**	0.716***	0.742**
	[0.001]	[0.028]	[0.004]	[0.012]
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Adjusted R^2	0.200	0.199	0.207	0.194
Observations	19,451	19,451	14,987	15,417

4.2.2 Controlling for potentially omitted correlated variables

I am concerned that the statistical significance relating to managerial ability may be due to omitted correlated variables. Other factors could make investors place a higher value on cash holdings of firms. Omitting these factors would overstate the statistical inference of managerial ability. For example, manager attributes can influence governance strength in firms (Karuna, 2006). Good

corporate governance could protect the interests of shareholders against the impulses and desires of management and as such increase the value of firms' cash holdings (Dittmar and Mahrt-Smith, 2007). In addition, high-ability managers have strong incentives to promote transparency by actively disclosing information about their firms' economic prospects because the market values such information (Trueman 1986; Easley and O'Hara 2004). Thus, highly ability managers can be related to lower information asymmetry. The free cash flow theory predicts that abundant cash bundled with asymmetric information leads to moral hazard and consequently to a lower marginal value of cash (Drobetz et al. 2010). Faulkender and Wang (2006) find that the marginal value of cash is substantially higher for constrained than for unconstrained firms. More recently, Tong (2011) shows that the value of cash is lower in diversified firms than in single-division firms, and that firm diversification reduces the value of cash among firms with poor corporate governance.

To address these concerns, we control for financial constraints, corporate governance, diversified status, and information asymmetry. First, the measure of financial constraints (denoted as FC) is the Kaplan and Zingales index (KZ index), as developed by Lamont, Polk, and Saa-Requejo (2001). This score is obtained by running an ordered logit of Kaplan and Zingales's (1997) scale of financing constraints onto observable characteristics. The firms with higher KZ index are classified as financially constrained, while the lower ones are financially unconstrained.

Second, I use Gompers, Ishii, and Metrick (2003) corporate governance index, G-score, to measure firms have good corporate governance or not. G-score is the number of antitakeover provision in firm's charter and in the legal code of the state where the firm is incorporated. The higher is the G-score, the lower is strength of corporate governance. The index is reported for 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004 and 2006 by the Investor Responsibility Research Center (IRRC). I use the G-scores for the most recent year when IRRC does not report G-scores.

Third, I use an indicator variable, which is named "DIV" as the proxy for diversification. The diversified firms are defined as firms owning at least two business segments, so they have different SIC codes. While the firms have only

SIC code, they are viewed as single-segment firms. DIV takes the value of one, if a firm reports more than one segment in a given year, and zero otherwise.

Finally, following Drobeta et al. (2010), I use various dimensions to establish information asymmetry index. There are five dimensions for information asymmetry and I rank them over all firms. When a firm ranks the 20% highest degree of information asymmetry, it gets a score of 5. On the contrary, a firm ranks the 20% lowest, it is assigned a score of 1. The five dimensions as follows:

The first is error in analysts' forecasts, and the calculation is as the actual EPS minus the consensus analysts' forecasts of EPS, deflated by consensus forecasts of EPS. Consensus forecasts of EPS are estimated as the median of individual analyst's forecasts reported in the IBES database for a fiscal year. The second is firm size. Total assets are used to measure firm size. Since larger firms construct disclosure policies and are monitored by more institutions and investors, they have less information asymmetry in general. The third is R&D expenditures dummy variable. If a firm includes R&D expenditures, the dummy is 1 or 0 if having no R&D or missing. Higher R&D expenditures represent greater degree of information asymmetry. The fourth is Tobin's Q, and it is calculated as book value of asset minus book value of equity plus market value of equity divided by book value of assets. Tobin's Q is used to measure growth opportunities. Smith and Watts (1992) find that information asymmetry deteriorates in firms with more growth opportunities. The fifth is analyst coverage, that is, the number of analysts following the firm. If a firm is followed by more analysts, the information about the firm is revealed more.

I add new control variables to the primary model one at a time, referred to as CV_t. The control is exercised through the interaction $CV_t * \triangle CASH_t$. Variable CV_t is included because omitting it would make the interpretation of the coefficient on $CV_t * \triangle CASH_t$ problematic if CV_t directly affects returns. On the other hand, to save space, I construct an ability index instead of using four separate proxies of managerial ability. Specifically, I rank press citations, DEA and industry-adjusted ROA into deciles and the highest ability managers are given value of 10. I transform the dummy value of award into 10 if the CEO was given any award in this year. I sum up the four scores and then divide by 40 to form ability index. Column 1 of table 4 shows the results using managerial

ability index. Similarly, I find that interaction term of $Ability\_Index_t * \triangle CASH_t$ is significantly positive, indicating managerial ability increases the value of cash.

Column 2 to 5 of Table 4 reports the estimation results after controlling for potentially omitted variables. Throughout the individual models, the coefficients on $ABILITY\_Index_t * \triangle CASH_t$ remain significantly positive, supporting our previous conclusion that high-ability managers improves value of cash holdings. In addition, the coefficients on the interactions between $\triangle CASH_t$ and firm governance, diversification, and information asymmetry are negative, and the coefficient on the interaction between $\triangle CASH_t$ and financial constraints, is positive. My findings confirm that the results reported in the earlier studies.

4.2.3 Value regressions

In this subsection, we employ an alternative measure of market valuation of cash. I follow the approach proposed by Pinkowitz, Stulz, and Williamson (2006) that examines the relation between cross-country institutional factors and cash valuation. I use the market-to-book ratio to estimate the marginal value of cash holdings in this robustness analysis. Specifically, I adopt the following model to investigate the relation between managerial ability and cash valuation.

$$\begin{aligned}\frac{MV_{i,t}}{NA_{i,t}} &= \alpha_0 + \alpha_1 \frac{EARN_{i,t}}{NA_{i,t}} + \alpha_2 \frac{dEARN_{i,t}}{NA_{i,t}} + \alpha_3 \frac{dEARN_{i,t+1}}{NA_{i,t}} + \alpha_4 \frac{dNA_{i,t}}{NA_{i,t}} + \alpha_5 \frac{dNA_{i,t+1}}{NA_{i,t}} \\ &+ \alpha_6 \frac{RD_{i,t}}{NA_{i,t}} + \alpha_7 \frac{dRD_{i,t}}{NA_{i,t}} + \alpha_8 \frac{dRD_{i,t+1}}{NA_{i,t}} + \alpha_9 \frac{INT_{i,t}}{NA_{i,t}} + \alpha_{10} \frac{dINT_{i,t}}{NA_{i,t}} + \alpha_{11} \frac{dINT_{i,t+1}}{NA_{i,t}} \\ &+ \alpha_{12} \frac{DIV_{i,t}}{NA_{i,t}} + \alpha_{13} \frac{dDIV_{i,t}}{NA_{i,t}} + \alpha_{14} \frac{dDIV_{i,t+1}}{NA_{i,t}} + \alpha_{15} \frac{dMV_{i,t+1}}{NA_{i,t}} + \alpha_{16} \frac{CASH_{i,t}}{NA_{i,t}} \\ &+ \alpha_{17} ABILITY_{i,t} \times \frac{CASH_{i,t}}{NA_{i,t}} + \alpha_{18} ABILITY_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

where $dX_{I,t}$ is a change in X from year t to year t+1; $MV_{i,t}$ is the market value of firm i at time t, and it is calculated as price times shares plus total liabilities; $NA_{i,t}$ is the net assets of firm i at time t; $EARN_{i,t}$ is the earnings before interest and

Table 4 The effect of CEO ability on value of cash holdings controlling for potentially omitted correlated variables

Table 4 presents fixed-effects regressions in Eq. (1). The definitions of the variables are presented in Appendix A. I use ***, **, and * to indicate significance at the 1%, 5%, and 10% levels, respectively. I also control for omitted correlated variables, including diversification, corporate governance, information asymmetry and financial constraints. KZ index is used as measurement of financial constraints; G-score is used to measure corporate governance index; firm diversification is a dummy variable and it equals to 1 if firms are diversified and 0 if single; information asymmetry index ranks the five dimensions, including error in analysts' forecasts, firm size, R&D expenditures dummy variable, Tobin's Q and analyst coverage. When a firm ranks the 20% highest degree of information asymmetry, it gets a score of 5.

Dependent variable: $ABRET_t$

	Baseline	Adding a single new control variable CV_t =			
Variables	Model	*FC*	*GOV*	*DIV*	*IA*
$\Delta CASH_t$	1.580***	1.974***	2.045***	1.567***	2.375***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta EARN_t$	0.592***	0.594***	0.742***	0.606***	0.567***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ΔNA_t	0.322***	0.321***	0.338***	0.319***	0.344***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta R\&D_t$	0.676**	0.685**	0.703*	0.409	-0.677
	[0.045]	[0.042]	[0.083]	[0.258]	[0.173]
ΔINT_t	-2.780***	-2.743***	-3.025***	-2.385***	-2.611***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ΔD_t	0.387	0.358	2.193**	0.187	-1.269
	[0.638]	[0.664]	[0.036]	[0.831]	[0.312]
$CASH_{t-1}$	0.388***	0.392***	0.344***	0.407***	0.577***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
LEV_t	-0.517***	-0.515***	-0.547***	-0.547***	-0.578***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
NF_t	-0.285***	-0.289***	-0.296***	-0.308***	-0.266***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$CASH_{t-1} * \Delta CASH_t$	-0.648***	-0.715***	-1.086***	-0.671***	-0.102
	[0.001]	[0.000]	[0.000]	[0.001]	[0.720]
$LEV_t * \Delta CASH_t$	-2.385***	-2.392***	-2.016***	-2.218***	-2.766***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$ABILITY\_Index_t$	-0.001	-0.001	-0.001	-0.001	-0.001
	[0.703]	[0.607]	[0.271]	[0.425]	[0.900]
$ABILITY\_Index_t *$	0.030***	0.033***	0.029***	0.038***	0.032**
$\Delta CASH_t$	[0.001]	[0.000]	[0.008]	[0.000]	[0.017]
CV_t		-0.003	0.003**	0.027***	0.005***
		[0.544]	[0.044]	[0.002]	[0.004]
$CV_t * \Delta CASH_t$		0.163**	-0.060***	-0.326***	-0.048**
		[0.017]	[0.006]	[0.002]	[0.034]
Industry dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.201	0.202	0.208	0.206	0.222
Observations	12,088	12,088	8,161	10,763	5,801

extraordinary items of firm i at time t; $RD_{i,t}$ is the R&D expenditures of firm i at time t and it is zero if missing; $INT_{i,t}$ is the interest expense of firm i at time t; $DIV_{i,t}$ is the common dividends of firm i at time t; $CASH_{i,t}$ is the cash holdings of firm i at time t. The origination of the value regression is from Fama and French (1998). And then Pinkowitz et al. (2006) divide total assets into cash and noncash to estimate value of cash. Comparing with Eq. (1) adapting abnormal return as dependent variables, cash holdings are used instead of change in cash. The industry fixed effect and year fixed effect are included in the specification model to control for unobserved industry-level heterogeneity macroeconomic effect.

In the model, the control variables include what affect expectation on future cash flows and value of the firm. They comprise current, past change, and future change of earnings (R&D expenditures, interest expense, common dividends), past change, and future change of noncash, future change of market value and cash level. Based on Pinkowitz et al. (2006), they use past change, and future change of cash holdings to replace with cash holdings. However, the change of total cash absorbing change in expectation on future cash flows is captured by other variables in Eq. (3) which using cash rather than change of cash.

The coefficients on the interaction terms of managerial ability with cash holdings capture the incremental relation between managerial ability and cash valuation. I expect that the estimates on α_{17} will be positive and significant.

Table 5 presents the results of the value regression in Eq. (3). The results for the variables of our interest, $ABILITY_t$ *$CASH_t$, are generally consistent with those reported in Tables 3 and 4. I find that cash holdings of firms managed by award-winning CEOs are valued at a premium. The coefficient for press citation interacted with cash holdings is significantly positive. The coefficients on DEA_score*CASHt and IndAdjRoa*CASHt is also highly significant. Overall, these results are consistent with those using the abnormal returns as the measure of firm value; that is, the cash holdings are assigned more value for firms with managers having excellent ability.

The signs of all control variables, except $dEARN_t$, I_t and $dDIV_t$ are consistent with Drobetz, Gruninger, and Hirschvogl (2010). In addition, the magnitudes of these control variables are similar with Drobetz, Gruninger, and Hirschvogl

(2010), but there are some differences. For example, absolute values of coefficients on interest expense and change in dividends are much larger. Although the coefficients of INT_t and $dDIV_t$ are positive significantly, the coefficients in the prior study are negative and not significant. The coefficient of dDIV_t is not significant. Furthermore, the coefficients of cash are about 2 and much higher. It shows one dollar put into cash increases firm value by more than double the value from Drobetz, Gruninger, and Hirschvogl (2010).

4.3 Additional Analyses

4.3.1 Moderating effect of business complexity and growth opportunities

Having observed the pervasiveness of the ability-cash-value association, we next consider whether this relation is also persistent across different types of firms. Specifically, identifying the characteristics of firms for which this association is particularly strong can provide insights into possible underlying economic mechanisms driving the cash value associated with managerial ability. The idea that a quality CEO may have a higher ability to obtain more precise information on investment opportunities, make better investment choices and achieve successful project outcomes with greater likelihood suggests that the impact of managerial ability on value of cash should be more pronounced among firms that are most likely to benefit from such resources: namely, firms confronting complex business organizations, as measured by multiple business segments, and firms that have high growth opportunities, as measured by low book-to-market ratio. We expect that any benefit associated with a firm's managerial ability is likely to be more pronounced in such firms.

Table 6 presents the results of the partitioning regressions and use the firm diversification as a partitioning variable. The evidence is clearly consistent with my prediction. In the multiple-segments firms, in which the business environment is more complex, we find that significant and higher coefficients on the $ABILITY_t$ *$\Delta CASH_t$, irrespective of $ABILITY_t$ proxies used. In contrast, in the single-segment firms, in which the business environment is less complex, we find that the coefficients on the $ABILITY_t$ *$\Delta CASH_t$ are smaller or even insignificant when managerial ability is measured either by press citations or DEA scores.

Table 5 The effect of CEO ability on the association between market-to-book ratio and cash holdings

Table 6 presents fixed-effects regressions in Eq. (3) under all four proxies of CEO ability,. The definitions of the variables are presented in Appendix C. I use ***, **, and * to indicate significance at the 1%, 5%, and 10% levels, respectively. P-Values are given in brackets.

Dependent variable: *MTB*

	Managerial ability (*ABILITY*) proxies =			
Variables	*AWARD*	*CITATION*	*DEA_Score*	*IndAdjROA*
$EARN_t$	2.926***	2.907***	2.597***	3.008***
	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta EARN_t$	0.163*	0.147*	0.102	0.109
	[0.065]	[0.091]	[0.290]	[0.357]
$\Delta EARN_{t+1}$	2.534***	2.508***	2.279***	2.525***
	[0.000]	[0.000]	[0.000]	[0.000]
$R\&D_t$	6.299***	6.262***	8.961***	5.290***
	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta R\&D_t$	3.142***	3.147***	2.674***	3.139***
	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta R\&D_{t+1}$	7.766***	7.905***	8.993***	7.536***
	[0.000]	[0.000]	[0.000]	[0.000]
DIV_t	2.877**	3.916***	0.601	1.316
	[0.014]	[0.000]	[0.633]	[0.307]
ΔDIV_t	6.614**	6.211**	7.370***	9.362***
	[0.010]	[0.014]	[0.008]	[0.001]
ΔDIV_t	2.401	3.419	2.599	-1.062
	[0.287]	[0.125]	[0.288]	[0.670]
INT_t	6.288***	5.521***	-2.204	4.034***
	[0.000]	[0.000]	[0.111]	[0.003]
ΔINT_t	-11.932***	-11.647***	-11.410***	-10.940***
	[0.000]	[0.000]	[0.000]	[0.000]
ΔINT_{t+1}	-3.356**	-3.634***	-5.988***	-6.382***
	[0.011]	[0.005]	[0.000]	[0.000]
ΔNA_t	0.974***	0.959***	0.846***	0.790***
	[0.000]	[0.000]	[0.000]	[0.000]
ΔNA_{t+1}	0.611***	0.616***	0.545***	0.591***
	[0.000]	[0.000]	[0.000]	[0.000]
ΔMV_{t+1}	-0.240***	-0.250***	-0.250***	-0.248***
	[0.000]	[0.000]	[0.000]	[0.000]
$CASH_t$	2.099***	2.002***	2.027***	2.018***
	[0.000]	[0.000]	[0.000]	[0.000]
$ABILITY_t$	-0.078	-0.009***	0.129	-0.326
	[0.109]	[0.000]	[0.323]	[0.142]
$ABILITY_t * CASH_t$	0.492***	0.037***	2.462***	0.956***
	[0.003]	[0.000]	[0.000]	[0.001]
Firm dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Adjusted R^2	0.777	0.782	0.784	0.780
Observations	17,066	17,066	13,216	13466

The formal X^2 test shows that the coefficient on the $ABILITY_t$ *$\Delta CASH_t$ is significantly higher in the diversified firms than in the focused firms, with a *p*-value of 0.034 or lower. The results suggest that the association between managerial ability and value of cash holdings are more pronounced in diversified firms in which more resources is being inappropriately diverted.

Table 7 reports regression results using the market-to-book ratio as a partitioning variable. Specifically, for each fiscal year-end, a firm is placed in the high growth group if its market-to-book ratio exceeds the sample median market-to-book ratio, and in the low growth group otherwise. I test our prediction by estimating regression (1) and comparing the coefficients on the $ABILITY_t$ *$\Delta CASH_t$ across the two groups sorted by market-to-book ratio. I find that the $ABILITY_t$ *$\Delta CASH_t$ is higher in the high growth groups, irrespective of proxies of managerial ability used. Furthermore, formal tests show that the difference is significant at the 5% level (or even lower). To summarize, the results in Table 7 are consistent with my prediction that managerial ability have a more pronounced effect on the value of cash when the firms have higher growth opportunities.

4.3.2 Valuation of *excess* cash

In Table 3, we use the change in cash and marketable securities as a proxy for excess cash. Following Dittmar and Mahrt-Smith (2007), we test another measure of excess cash as a sensitivity test based on model (1). Excess cash (XCASH) is computed as the residual from regressing cash holdings on a set of variables that determine normal cash holdings. Our choice of the independent variables is based on Opler et al. (1999). The dependent variable is cash and marketable securities scaled by total assets minus cash and marketable securities. The independent variables include firm size, leverage, market value to book value of net assets, firm operating cash flows to net assets, the standard deviation of operating cash flows to net assets during the previous 20 years, net working capital to net assets, research and development expense to net assets, capital expenditure to net assets, and dividend payment dummy. In addition, we also control for both industry and year fixed effects. The top and bottom 1%

Table 6 Business complexity and the effect of CEO ability on value of cash holdings

Table 6 presents fixed-effects regressions in Eq. (1). Under all four proxies of CEO ability, I split the sample into diversified firms and focused firms. The definitions of the variables are presented in Appendix A. I use ***, **, and * to indicate significance at the 1%, 5%, and 10% levels, respectively. P-Values are given in brackets.

Dependent variable: $ABRET_t$

ABILITY=	*AWARD*		*CITATION*		*DEA_Score*		*IndAdjROA*	
Variables	Multi-segment	Single segment	Multi-segment	Single segment	Multi-segment	Single segment	Multi-segment	Single segment
$\Delta CASH_t$	1.516***	2.549***	1.546***	2.570***	1.765***	2.532***	1.676***	2.278***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta EARN_t$	0.643***	0.508***	0.643***	0.509***	0.672***	0.492***	0.693***	0.553***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ΔNA_t	0.241***	0.373***	0.246***	0.373***	0.262***	0.378***	0.249***	0.352***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta R\&D_t$	0.762	0.162	0.745	0.159	0.881	0.073	0.724	0.109
	[0.137]	[0.673]	[0.147]	[0.678]	[0.112]	[0.862]	[0.201]	[0.799]
ΔINT_t	-0.912*	-3.393***	-0.895*	-3.397***	-1.374***	-3.198***	-0.845*	-3.952***
	[0.056]	[0.000]	[0.061]	[0.000]	[0.008]	[0.000]	[0.092]	[0.000]
ΔDIV_t	1.108	0.537	1.178	-0.546	0.501	-1.222	1.215	-0.009
	[0.250]	[0.651]	[0.222]	[0.646]	[0.619]	[0.327]	[0.252]	[0.994]
$CASH_{t-1}$	0.553***	0.468***	0.551***	0.471***	0.519***	0.462***	0.397***	0.449***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
LEV_t	-0.590***	-0.611***	-0.589***	-0.610***	-0.559***	-0.574***	-0.593***	-0.560***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
NF_t	-0.164***	-0.329***	-0.173***	-0.325***	-0.209***	-0.369***	-0.187***	-0.331***
	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$CASH_{t-1} * \Delta CASH_t$	-0.158	-0.846***	-0.199	-0.878***	-0.512	-0.934***	-1.017***	-0.634***
	[0.561]	[0.000]	[0.462]	[0.000]	[0.111]	[0.000]	[0.002]	[0.006]
$LEV_t * \Delta CASH_t$	-1.202***	-2.844***	-1.248***	-2.857***	-1.698***	-2.572***	-1.659***	-2.505***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$ABILITY_t$	-0.024	-0.031	-0.001	-0.001	0.069*	0.102***	-0.228***	0.010
	[0.189]	[0.133]	[0.220]	[0.625]	[0.088]	[0.005]	[0.002]	[0.828]
$ABILITY_t * \Delta CASH_t$	1.318***	0.624**	0.021**	0.012	1.285***	0.431	1.882***	0.900**
	[0.001]	[0.030]	[0.019]	[0.259]	[0.003]	[0.213]	[0.004]	[0.019]
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.213	0.214	0.212	0.213	0.223	0.215	0.221	0.203
Observations	6,390	8,804	6,390	8,804	5,419	7,339	5,395	7,160

Table 7 Growth opportunities and the effect of CEO ability on value of cash holdings

Table 7 presents fixed-effects regressions in Eq. (1). Under all four proxies of CEO ability, I split the sample into high-growth firms and low-growth firms based on market-to-book ratio. The definitions of the variables are presented in Appendix A. I use ***, **, and * to indicate significance at the 1%, 5%, and 10% levels, respectively. P-Values are given in brackets.

Dependent variable: $ABRET_t$

ABILITY=	*AWARD*		*CITATION*		*DEA_Score*		*IndAdjROA*	
Variables	High Growth	Low Growth	High Growth	Low Growth	High Growth	Low Growth	High Growth	Low Growth
$\Delta CASH_t$	2.902***	1.185***	2.901***	1.190***	3.172***	1.338***	2.728***	1.139***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta EARN_t$	0.740***	0.404***	0.741***	0.405***	0.797***	0.420***	0.784***	0.426***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ΔNA_t	0.637***	0.281***	0.642***	0.281***	0.726***	0.279***	0.602***	0.289***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta R\&D_t$	0.155	-0.756**	0.188	-0.763**	1.265***	-0.428	0.622	-0.627*
	[0.691]	[0.019]	[0.629]	[0.018]	[0.004]	[0.213]	[0.158]	[0.089]
ΔINT_t	-3.285***	-2.222***	-3.395***	-2.218***	-4.602***	-2.641***	-3.099***	-2.198***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ΔDIV_t	-0.332	0.529	-0.539	0.566	-1.934	0.872	-0.805	0.773
	[0.790]	[0.421]	[0.665]	[0.389]	[0.147]	[0.237]	[0.545]	[0.292]
$CASH_{t-1}$	1.214***	0.297***	1.227***	0.298***	1.135***	0.320***	1.061***	0.272***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
LEV_t	-0.619***	-0.245***	-0.611***	-0.245***	-0.579***	-0.233***	-0.591***	-0.251***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
NF_t	-0.297***	-0.368***	-0.293***	-0.369***	-0.401***	-0.363***	-0.323***	-0.393***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$CASH_{t-1} * \Delta CASH_t$	-0.477	-0.015	-0.481	-0.029	-1.573***	-0.293*	-0.267	-0.190
	[0.123]	[0.907]	[0.120]	[0.828]	[0.000]	[0.068]	[0.455]	[0.212]
$LEV_t * \Delta CASH_t$	-3.522***	-0.953***	-3.616***	-0.958***	-3.896***	-1.151***	-3.645***	-0.760***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$ABILITY_t$	-0.069***	0.002	-0.001***	0.001	0.107***	-0.038	-0.145***	-0.057
	[0.000]	[0.872]	[0.002]	[0.522]	[0.004]	[0.171]	[0.003]	[0.279]
$ABILITY_t * \Delta CASH_t$	0.968***	0.467**	0.038***	0.008	1.625***	0.493**	1.233***	0.584
	[0.003]	[0.044]	[0.001]	[0.142]	[0.002]	[0.041]	[0.003]	[0.118]
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.262	0.220	0.262	0.219	0.271	0.231	0.245	0.229
Observations	9,392	9,396	9,392	9,396	7,269	7,435	7,466	7,654

of the dependent and independent continuous variables are excluded to mitigate the effects of outliers.

The results of using excess cash are reported in Table 8. The coefficients on control variables are very comparable to those reported in Table 3. The results for our variables of interests remain similar to those in Table 3. When using CEO award as the measure of managerial ability, I again found interesting results. Excess cash of firms run by the award-winning managers is valued at a premium by the market. The coefficient on $CITATION_t * \Delta XCASH_t$ is positive and significant at conventional levels. Also, the coefficient on DEA_Score*XCASH and IndAdjRoa*XCASH are highly significant. Overall, our results using excess cash computed based on regression (1) are consistent with those reported in Tables 3.

4.3.3 Managerial ability and the use of excess cash

The results reported above indicate that cash held by firms hiring low-ability managers is valued at a discount. These results suggest that those firms may not be spending their money in the best possible way. Following Dittmar and Mahrt-Smith (2007), we examine this issue indirectly by analyzing the return on asssets (ROA) for firms with positive (lagged) excess cash and above median spending on capital expenditures separately.

Specifically, we estimate the following regression:

$$ROA_{i,t} = \delta_0 + \delta_1 \frac{XCsah_{i,t-1}}{NA_{i,t-1}} + \delta_2 ABILITY_{i,t-1} + \delta_3 \frac{XCASH_{i,t-1}}{NA_{i,t-1}} \times ABILITY_{i,t-1}$$
$$+ \delta_4 Ln(NA_{i,t}) + \delta_5 \frac{PPE_{i,t}}{NAi,t} + \delta_6 ROA_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

where $ROA_{i,t}$ is calculated as operating income divided by net assets for firm i at time t subtract the average ROA; $XCash_{i,t}$ = Excess Cash at time t (= Total Cash and Cash Equivalents minus the normal level of cash at time t); $NA_{i,t}$ is the net assets of firm i at time t, and it is computed by total asset minus cash; $PPE_{i,t}$ is property, plant and equipment for firm i at time t.

I am interested in the coefficient of the interaction term between lagged excess cash and the lagged managerial ability measure. A positive coefficient (δ_3) on this interaction term indicates that for every dollar of excess cash held at time t-1, firms with high-ability managers who spend large amounts of cash on

Table 8 The effect of CEO ability on the association between change in market value and change in excess cash holdings

Table 8 presents fixed-effects regressions in Eq. (1) using positive excess cash rather than cash as control variable. The definitions of the variables are presented in Appendix A. I use ***, **, and * to indicate significance at the 1%, 5%, and 10% levels, respectively. P-Values are given in brackets.

Dependent variable: $ABRET_t$				
	Managerial ability (*ABILITY*) proxies =			
Variables	*AWARD*	*CITATION*	*DEA_Score*	*IndAdjROA*
$\Delta XCASH_t$	0.130***	0.130***	0.325***	0.175***
	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta EARN_t$	0.675***	0.675***	0.679***	0.682***
	[0.000]	[0.000]	[0.000]	[0.000]
ΔNA_t	0.196***	0.197***	0.207***	0.184***
	[0.000]	[0.000]	[0.000]	[0.000]
$\Delta R\&D_t$	1.171***	1.154***	1.534***	0.806**
	[0.000]	[0.000]	[0.000]	[0.015]
ΔINT_t	-2.620***	-2.631***	-3.075***	-2.056***
	[0.000]	[0.000]	[0.000]	[0.000]
ΔDIV_t	0.683	0.649	0.373	0.687
	[0.339]	[0.363]	[0.634]	[0.380]
$XCASH_{t-1}$	0.291***	0.293***	0.320***	0.286***
	[0.000]	[0.000]	[0.000]	[0.000]
LEV_t	-0.609***	-0.608***	-0.605***	-0.607***
	[0.000]	[0.000]	[0.000]	[0.000]
NF_t	0.012	0.018	-0.031	-0.017
	[0.703]	[0.583]	[0.415]	[0.631]
$XCASH_{t-1} * \Delta XCASH_t$	-0.077**	-0.079**	-0.187***	-0.091**
	[0.044]	[0.039]	[0.001]	[0.049]
$LEV_t * \Delta XCASH_t$	-0.329***	-0.328***	-0.639***	-0.444***
	[0.000]	[0.000]	[0.000]	[0.000]
$ABILITY_t$	-0.018	0.001	0.107***	-0.026
	[0.125]	[0.400]	[0.000]	[0.486]
$ABILITY_t * \Delta XCASH_t$	0.254***	0.004***	0.149**	0.081***
	[0.000]	[0.001]	[0.014]	[0.000]
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Adjusted R^2	0.200	0.146	0.162	0.151
Observations	19,451	19,451	14,987	15,417

capital expenditures experience a higher ROA in that year compared to firms with low ability managers. The results for the whole sample show that this indeed is the case for all four proxies for managerial ability (see columns 1 to 4 in Table 9). Given the agency problems related to excess cash, we expect to find a negative effect of excess cash on future operating performance. The results in Table 9 show that this in fact is the case.

Table 9 The effect of CEO ability on the association between positive excess cash holdings and subsequent operating performance

Table 9 presents fixed-effects regressions in Eq. (4) under all four proxies of CEO ability,. I use ROA subtract the industry average ROA as operating performance. The definitions of the variables are presented in Appendix D. I use ***, **, and * to indicate significance at the 1%, 5%, and 10% levels, respectively. P-Values are given in brackets.

Dependent variable: ROA_t				
	Managerial ability (*ABILITY*) proxies =			
Variables	*AWARD*	*CITATION*	*DEA_Score*	*IndAdjROA*
$XCASH_{t-1}$	-0.016***	-0.008***	-0.010***	-0.010***
	[0.000]	[0.000]	[0.000]	[0.000]
$ABILITY_{t-1} * XCASH_{t-1}$	0.015**	0.001*	0.027**	0.021***
	[0.033]	[0.060]	[0.042]	[0.000]
$ABILITY_{t-1}$	0.001	-0.001	-0.012	-0.072***
	[0.749]	[0.116]	[0.107]	[0.000]
$LnNA_t$	-0.012***	-0.013***	-0.015***	-0.013***
	[0.000]	[0.000]	[0.000]	[0.000]
PPE_t	0.022***	0.033***	0.045***	0.031***
	[0.005]	[0.000]	[0.000]	[0.001]
ROA_{t-1}	0.578***	0.551***	0.586***	0.549***
	[0.000]	[0.000]	[0.000]	[0.000]
Firm dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Adjusted R^2	0.786	0.780	0.815	0.782
Observations	10,417	10,417	8,212	8,830

4.3.4 Managerial ability and the level of cash holdings

I have shown that high-ability managers tend to utilize cash resources more efficiently than low ability ones and, consequently, cash held by firms with high-ability managers is valued at a premium. To further examine the relation between managerial ability and cash holdings, I provide a multivariate analysis of managerial ability and the level of their cash holdings.

I expand the regression model described in section 3.4 to derive excess cash by including managerial ability proxies. The results are reported in Table 10. In Columns 1, I use awards as managerial ability and it shows a significantly positive relation between managerial ability and corporate cash holdings at less than 1% level. In Columns 2, I also gauge the same model specification and using press citation as the ability measure. The sign of press citation provides support for the expected relation. In Columns 3, I use DEA to estimate the relation between managerial ability and cash holdings. The result keeps most

of their statistical significance and signs. The variable of interest is DEA and it is significantly positive with cash level. In Columns 4, it shows results using industry-adjusted ROA as managerial ability to affect on the cash level. The industry-adjusted ROA is positive with cash holdings. Therefore, all else equal, firms with quality managers have larger cash holdings than other firms. These results are consistent with the argument that high-ability managers have better investment efficiency relative to low-ability ones, therefore they can afford to hold large balance of cash to fund future positive NPV projects.

With regard to other control variables, I generally find the directions of coefficient are similar to prior literature, Opler et al. (1999). The table presents that market-to-book ratio, cash flow, R&D expenses, capital expenditure and regulation dummy are significantly and positively related with corporate cash holdings. The positive coefficients of these variables represent firms accumulate more cash. It also shows that the relation between level of cash holdings and firm size, net working capital, leverage, industry Sigma or dividend dummy.

5. Conclusion

I examine the relation between managerial ability and value of cash holdings. Using a large dataset of firms and multiple proxies for managerial ability for the period of 1992-2010, I find evidence consistent with the notion that highly ability managers market value of a marginal dollar of cash. Results are robust to a level specification. I also provide evidence that managerial ability matters most when firms have relatively high growth opportunities and relatively complex business structure. I further find that firms with more highly ability managers enjoy higher subsequent operating performance. Results are robust to a host of variables known to be associated with value of cash. Overall, this study contributes to the emerging literature on the role of managerial ability for firm decisions and outcomes.

Table 10 The effect of CEO ability on the level of cash holdings

Table 10 presents fixed-effects regressions in Eq. (2) under all four proxies of CEO ability, The definitions of the variables are presented in Appendix B. I use ***, **, and * to indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: $CASH_t$				
	Managerial ability (*ABILITY*) proxies =			
Variables	*AWARD*	*CITATION*	*DEA_Score*	*IndAdjROA*
$SIZE_t$	-0.236***	-0.247***	-0.205***	-0.204***
	[0.000]	[0.000]	[0.000]	[0.000]
MB_t	0.100***	0.097***	0.131***	0.124***
	[0.000]	[0.000]	[0.000]	[0.000]
CF_t	0.451***	0.449***	0.580***	0.264***
	[0.000]	[0.000]	[0.000]	[0.000]
NWC_t	-0.956***	-0.943***	-1.168***	-0.867***
	[0.000]	[0.000]	[0.000]	[0.000]
$BLEV_t$	-1.388***	-1.376***	-1.544***	-1.409***
	[0.000]	[0.000]	[0.000]	[0.000]
IND_SIGMA	-0.014***	-0.014***	0.002	-0.016***
	[0.003]	[0.003]	[0.723]	[0.003]
D_DUM_t	-0.325***	-0.316***	-0.341***	-0.347***
	[0.000]	[0.000]	[0.000]	[0.000]
RD_t	0.056***	0.055***	0.707***	0.063***
	[0.000]	[0.000]	[0.000]	[0.000]
$CAPEX_t$	0.570***	0.599***	0.366*	0.393**
	[0.000]	[0.000]	[0.070]	[0.044]
REG_DUM_t	0.254***	0.354***	0.060	0.229**
	[0.009]	[0.000]	[0.610]	[0.033]
$MGR\_ABILITY_t$	0.281***	0.009***	0.210***	0.285**
	[0.000]	[0.000]	[0.008]	[0.018]
Adjusted R^2	0.442	0.444	0.475	0.444
Observations	19,091	19,091	14,860	15,263

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Appendix A: Variable Definitions for Return Regressions

variables	Measurement
ΔX	The changes in the variable X for firm i from the prior year to the specified year, deflated by market value of equity at time t-1.
$ABRET_t$	The abnormal return over the fiscal year. It is calculated as the stock return over fiscal year t-1 to t subtracts stock's value-weighted benchmark return over fiscal year t-1 to t. To calculate stock's value-weighted benchmark return, I use 25 Fama and French portfolios based on size and book-to-market.
$CASH_t$	The cash holdings at time t, deflated by market value of equity at time t-1.
$EARN_t$	The earnings before interest and extraordinary items which is consisted of earnings before interest and extraordinary, interest, deferred tax credits, and investment tax credits at time t, deflated by market value of equity at time t-1.
NA_t	The net assets which is computed by total asset minus cash at time t, deflated by market value of equity at time t-1.
$R\&D_t$	The R&D expenditures and it is zero if missing at time t, deflated by market value of equity at time t-1.
INT_t	The interest expense at time t, deflated by market value of equity at time t-1.
DIV_t	The common dividends at time t, deflated by market value of equity at time t-1.
LEV_t	Market leverage which is calculated as total debit divided by total debit plus market value of equity at time t.
NF_t	Net financing which is calculated as equity issuance minus repurchases plus debt issuance minus debt redemption at time t, , deflated by market value of equity at time t-1.

Appendix B: Variable Definitions for Cash Level Model

variables	Measurement
$Cash_t$	The natural logarithm of cash to net assets. It is calculated as cash divided by assets less cash holdings.
$SIZE_t$	The natural logarithm of net assets and be deflated using the CPI to 1994 dollars.
MB_t	a ratio calculated by the book value of assets minus the book value of equity plus the market value of equity as the numerator, and the book value of net asset as the denominator.
CF_t	A ratio which cash flow as the numerator, and total asset less cash holdings as the denominator.
NWC_t	A ratio which net working capital as the numerator, and total asset less cash holdings as the denominator. Net working capital is measured by current assets minus cash minus current liabilities.
$BLEV_t$	It is calculated as total debt divided by total assets. Total debt is consisted of short-term debt and Long-term debt
IND_SIGMA	Industry Sigma. It is the mean of standard deviations of cash flow over assets over 20 years, for firms in the same industry which haves the same 2-digit SIC code.
D_DUM_t	Dividend Dummy. Dividend dummy variable equals to one if the firm paid a common dividend in the year and zero if not.
RD_t	A ratio which research and development expense as the numerator, and sales as the denominator. R&D is equal to zero when it is missing.
$CAPEX_t$	A ratio which capital expenditure as the numerator, and total asset less cash holdings as the denominator.
REG_DUM_t	Regulation dummy. Regulation dummy equals to one if the firm is in a regulated industry for the year, and equals to 0 if it is not.

Appendix C: Variable Definitions for Value Regressions

variables	Measurement
ΔX	The changes in the variable X for firm i from the prior year to the specified year, deflated by NA_t.
$EARN_t$	The earnings before interest and extraordinary items which is consisted of earnings before interest and extraordinary, interest, deferred tax credits, and investment tax credits at time t, , deflated by NA_t.
NA_t	The net assets which is computed by total asset minus cash at time t, deflated by NA_t.
$R\&D_t$	The R&D expenditures and it is zero if missing at time t, deflated by NA_t.
INT_t	The interest expense at time t, deflated by NA_t.
DIV_t	The common dividends at time t, deflated by NA_t.
MV_t	Market value of equity at time t, deflated by NA_t.
$CASH_t$	The cash holdings at time t, deflated by NA_t.

Appendix D: Variable Definitions for ROA Regressions

variables	Measurement
ROA_t	It is calculated as operating income divided by net assets at time t subtract the industry average ROA.
$XCASH_{t-1}$	It is calculated as lagged excess cash divided by lagged net assets. The excess cash is computed as the residual of the cash holdings regression in the model of Eq. (1) following Opler et al. (1999).
NA_t	The net assets which is computed by total asset minus cash at time t.
PPE_t	It is calculated as property, plant and equipment at time t divided by net assets.