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Earnings Quality Effect on Corporate Excess Cash Holdings and Their Marginal Value*

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ABSTRACT: By using panel data from Korea listed firms, we find that firms with poor earnings quality are more likely to accumulate excess cash holdings, perhaps in an attempt to buffer themselves from information asymmetry problems. We also find that firms with poor earnings quality are more likely to discount the marginal value of their excess cash holdings because their shareholders appear to question the reason for such cash policy changes from the agency theory perspective. Overall, our results suggest that information asymmetry and agency problems are likely to co-exist in firms with poor earnings quality.

KEY WORDS: earnings quality, excess cash holdings, marginal value, information asymmetry, agency theory

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Introduction

The accuracy of a firm's financial reporting is a major determinant of information asymmetry. For example, Bushman and Smith (2001) and Verrecchia (2001) suggest that higher quality financial reporting mitigates the information asymmetry problems that cause economic friction, such as adverse selection and moral hazards. Accounting and finance literature frequently uses the quality of accounting earnings (hereafter, earnings quality) as a proxy for the accuracy of a firm's financial reporting. Ball and Shivakumar (2008) argue that the accuracy of a firm's financial reporting increases the earnings quality. Francis et al. (2005) report that higher earnings quality improves trust relationships among stakeholders and ameliorates the consequences of information asymmetry. On the other hand, poor earnings quality creates uncertainty about the financial health of the firm and gives rise to suspicions that the earnings may be managed.

Firms with higher cash holdings are likely to be exposed to severe information asymmetry problems. Garcia-Teruel et al. (2009) state that information asymmetry is itself partially responsible for corporate cash holdings. A firm that is informatively opaque is more likely to accumulate cash holdings than is a firm that is informatively transparent. Firms with a high degree of information asymmetry have higher external financing costs. Such firms must rely more heavily on internal sources of funds, and must necessarily accumulate cash holdings for their operational and investment needs. Accordingly, firms with poor earnings quality accumulate higher cash holdings than do firms with good earnings quality.

Easley and O'Hara (2004) suggest that information asymmetry adversely affects the cost of capital in the case of imperfect competition. Bhattacharya et al. (2003) and Francis et al. (2005) argue that poor earnings quality increases information asymmetry, which leads to a higher cost of capital. An increase in the cost of capital lowers the marginal value of excess cash holdings because it is the discount rate used to value assets. Drobetz et al. (2010) find that Jensen's (1986) free cash flow theory predicts that excess cash holdings have a negative effect on their marginal value in states with moral hazard problems.

We empirically analyze the effect of earnings quality on corporate excess cash holdings and their marginal value as follows. The sample firms are selected from those listed on the Korea Exchange from 2000 to 2014. We estimate the quality of three accruals as proxies for earnings quality and aggregate the three proxies into one aggregate score. Excess cash holdings are determined using the models of Opler, Pinkowitz, Stulz, and Williamson (hereafter, OPSW, 1999) and DeAngelo, DeAngelo, and Stulz (hereafter, DDS, 2010). The marginal value of excess cash holdings is determined following Dittmar and Mahrt-Smith (2007).

Our main findings are as follows. First, we find that firms with poor earnings quality are more likely to accumulate excess cash holdings, perhaps in an attempt to buffer themselves from information asymmetry problems. This finding supports the information asymmetry argument that poor earnings quality aggravates information asymmetry and makes raising external capital more difficult and more expensive for firms. Second, we find that firms with poor earnings quality are more likely to discount the marginal value of their excess cash holdings because their shareholders appear to question the reason for such cash policy changes from the agency theory

perspective. This finding supports the agency theory argument that managers tend to waste corporate resources by hoarding excess cash, particularly when faced with increased information asymmetry. This finding also corroborates the finding of Drobetz et al. (2010), who suggest that the free cash flow theory predicts that excess cash holdings, bundled with higher information asymmetry, generate moral hazard problems, and lead to a lower market value of a marginal dollar of cash. Overall, our results show that poor earnings quality has a positive effect on the level of excess cash holdings and a negative effect on the marginal value of excess cash holdings. This suggests that information asymmetry and agency problems are likely to co-exist in firms with poor earnings quality.

The remainder of this paper is organized as follows. Section 2 reviews the literature in this field and develops our hypotheses. Section 3 describes the research design, and Section 4 presents our empirical results. Lastly, Section 5 presents our conclusions and their implications for financial policy.

Literature Review and Hypotheses

Despite theoretical models that value a firm's cash flows, accounting earnings are widely used in stock valuations and to measure firm performance. In particular, the earnings quality provides important information on a firm's current and future cash flows. When earnings quality is poor, the firm's cash flows fluctuate for reasons unrelated to its business risk. OPSW (1999) and Mikkelson and Partch (2003) show that firms hedge against future cash flow uncertainty by increasing the precautionary level of cash holdings when cash flow volatility is higher.

The conceptual definition of earnings quality focuses on the accuracy with which accounting earnings convey information about expected cash flows to inform external stakeholders, particularly investors and creditors. If accounting earnings are of good quality, they are more representative of future cash flows. Consequently, good earnings quality facilitates estimations of future cash flows using accounting information. However, poor earnings quality might aggravate information asymmetry between managers and external stakeholders. Nanda and Narayanan (1999) argue that information asymmetry causes misvaluations of bond and stock prices, and Myers and Majluf (1984) show that information asymmetry makes raising capital by firms more expensive. Information asymmetry provides another motivation for firms to accumulate excess cash holdings for transactional and investment needs. Dittmar et al. (2003), Ferreira and Vilela (2004), and Ozkan and Ozkan (2004) find that the level of cash holdings is positively related to the degree of information asymmetry. Francis et al. (2005) argue that poor earnings quality creates uncertainty about the financial health of a firm and aggravates information asymmetry. Beatty et al. (2010) suggest that earnings quality is likely to be more important for a firm with severe information asymmetry problems. Therefore, poor earnings quality makes external financing more expensive and motivates firms to accumulate cash holdings from internally generated cash flows for their transactional and investment needs and precautionary balances.

We use accruals quality as a proxy for earnings quality and hypothesize that firms with poor earnings quality require higher excess cash holdings. We also consider that earnings quality might reduce information asymmetry problems, affecting the costs of external financing. Therefore, firms with poor earnings quality must maintain higher excess cash holdings to finance their investment projects. This leads to our first hypothesis:

Hypothesis 1: Firms with poor earnings quality are more likely to accumulate their excess cash holdings than are firms with good earnings quality.

The marginal value of excess cash holdings is very important, given that the primary goal of financial management is shareholder wealth maximization. Therefore, we focus on shareholders' perceptions of excess cash held by a firm that has poor earnings quality. When a firm's earnings quality is poor, its access to capital markets might be relatively limited. If such a firm accumulates excess cash holdings beyond the normal level that maximizes shareholder wealth, its shareholders may question the origin of the cash stockpile from the agency theory perspective. If the cash stockpile occurs because of capital spending curtailments, then shareholder wealth is likely to be affected negatively.

Harford (1999) and Bates (2005) find evidence that firms with excess cash holdings are more likely to spend on acquisitions that subsequently perform poorly. Blanchard et al. (1994) report that firms with windfall legal settlements might easily fritter away the money through wasteful investments and acquisitions. Amihud and Lev (1981) suggest that managers undertake corporate diversification for their own benefit, rather than to benefit shareholders. OPSW (1999) argue that corporate cash holdings are similar to free cash flows, and enable managers to engage in investment projects that the capital markets are unwilling to finance. Moreover, DuCharme et al. (2004), Louis (2004), and Jo et al. (2007) provide evidence that supports the existence of earnings management by managers. Bergstresser and Philippon (2006) and Coles et al. (2006) also report evidence that supports the charge of earnings management for private managerial benefit.

An alternative explanation for the effects of cash holdings on firm value is based on agency theory. To reduce the risk of corporate default, managers may accumulate cash holdings beyond the normal level that maximizes shareholder wealth. However, Jensen and Meckling (1976) argue that managers frequently use corporate resources inefficiently if unmonitored. Similarly, the free cash flow theory of Jensen (1986) suggests that managers have an incentive to accumulate cash holdings because free cash flow is the only financial resource they can liberally control. Harford et al. (2008) and Pinkowitz et al. (2006) find evidence consistent with the view that increased cash holdings generate agency problems. The agency theory argument may play a further role, because managers have an incentive to accumulate cash holdings.

Pinkowitz et al. (2006) show that in countries where legal protection is weak, investors value reserves at a large discount, and Dittmar and Mahrt-Smith (2007) find that when there is monitoring pressure on insiders, investors value cash holdings at a sizable discount. Belkhir et al. (2014) find that excess cash holdings contribute less to firm value when minority shareholders are more likely to be expropriated by controlling shareholders. Then, Boubaker et al. (2015a) suggest that geographic remoteness can be conducive to severe agency problems, particularly when there is a large separation of cash-flow rights and control rights, leading to firms to discretionarily accumulate cash rather than distribute it to shareholders.

Several studies also measure the marginal value of cash holdings under financial constraints. Faulkendrer and Wang (2006) find that an extra dollar of cash holdings is more valuable for shareholders of financially constrained firms because an additional dollar of internal funds enables a constrained firm to avoid high costs of raising funds. However, Pinkowitz and

Williamson (2007) find that firms that are likely to experience financial distress have their cash valued at a considerable discount. Lee and Powell (2011) document that the market punishes persistent, rather than transitory, excess cash holdings by discounting the marginal value of that cash stock.

These previous studies provide extensive evidence that shareholders increase the discount rate they apply to the excess cash held by a firm with poor earnings quality. Consequently, the marginal value of an additional dollar of excess cash held by a firm with poor earnings quality is incorporated into firm value at less than a dollar. Based on the above discussion, we postulate the following hypothesis:

Hypothesis 2: Firms with poor earnings quality are more likely to discount the marginal value of their excess cash holdings than are firms with good earnings quality.

Research Design

Proxies for Earnings Quality

Although earnings management can be achieved by various means, such as using accruals, changing accounting methods, or changing the capital structure, previous studies focus on total accruals as the source of earnings management. DeAngelo (1986) and McNichols and Wilson (1988) discuss the portioning of total accruals into discretionary and nondiscretionary components, and Jones (1991) uses the discretionary portion of total accruals as a proxy for earnings quality. However, there is no universally accepted measure for earnings quality.

Therefore, we estimate the quality of three accruals as proxies for earnings quality, and aggregate the three proxies into one score.

We first employ the model of Dechow et al. (1995), shown in equation (1), to estimate discretionary accruals as total accruals less expected nondiscretionary accruals. In deriving their model, Dechow et al. (1995) modify the model of Jones (1991). Because a sales change variable in the Jones (1991) model is replaced by a modified sales change variable, defined as ($\Delta S - \Delta AR$), this approach excludes the possibility of earnings management being attributable to changes in accounts receivables. The Dechow et al. (1995) model is given as follows:

$$\frac{TA_{i,t}}{A_{i,t-1}} = a_0\left(\frac{1}{A_{i,t-1}}\right) + a_1\left(\frac{\Delta S_{i,t}-\Delta AR_{i,t}}{A_{i,t-1}}\right) + a_2\left(\frac{PPE_{i,t}}{A_{i,t-1}}\right) + \epsilon_{i,t} \quad (1)$$

where $TA_{i,t}$ denotes the total accruals of firm *i* in year *t*; $\Delta S_{i,t}$, $\Delta AR_{i,t}$, and $PPE_{i,t}$ are the changes in sales, accounts receivables, and gross property, plant, and equipment, respectively, of firm *i* in year *t*; $A_{i,t-1}$ denotes the total assets of firm *i* in year *t*–1; and ϵ_t is an error term. All variables in equation (1) are scaled by lagged total assets to reduce heteroskedasticity.

The discretionary accruals based on the Dechow et al. (1995) model are estimated cross-sectionally per year using all firm-year observations in the same two-digit SIC industry. First, we estimate parameters (a_0, a_1, and a_2) for each variable in equation (1). Then, we compute the expected nondiscretionary accruals by applying these parameters to each firm. Finally, we estimate the discretionary accruals as total accruals less expected nondiscretionary accruals. Consequently, the discretionary accruals based on the model of Dechow et al. (1995) are the same as those obtained from the annual cross-sectional industry regression model in equation (1).

Following Srinidhi and Gul (2007) and Garcia-Teruel et al. (2010), given the short longitudinal time frame in the study, the absolute value of this residual is usable as an inverse measure of accruals quality. Therefore, our first proxy for earnings quality will be the absolute value of the residuals in equation (1) ($AQ_{i,t}^{Dechow} = |\varepsilon_{i,t}|$). Thus, higher values of $AQ_{i,t}^{Dechow}$ indicate lower earnings quality.

We also use the Dechow et al. (1998) CFO model and the Kothari et al. (2005) ROA-performance-matched-discretionary-accrual model to estimate the discretionary accruals. The Dechow et al. (1998) CFO model, shown in equation (2), includes cash flows from operations (CFO) in addition to the sales changes and gross property, plant, and equipment in the Jones (1991) model. Then, the changes in accounts receivable in the Dechow et al. (1995) model are replaced with CFO in the Dechow et al. (1998) CFO model. Discretionary accruals in the Dechow et al. (1998) CFO model are estimated in a manner similar to the Dechow et al. (1995) model. Therefore, our second proxy for earnings quality will be the absolute value of the residuals in equation (2) ($AQ_{i,t}^{CFO} = |\varepsilon_{i,t}|$). In this case, higher values of $AQ_{i,t}^{CFO}$ indicate lower earnings quality:

$$\frac{TA_{i,t}}{A_{i,t-1}} = b_0\left(\frac{1}{A_{i,t-1}}\right) + b_1\left(\frac{\Delta S_{i,t}}{A_{i,t-1}}\right) + b_2\left(\frac{PPE_{i,t}}{A_{i,t-1}}\right) + b_3\left(\frac{CFO_{i,t}}{A_{i,t-1}}\right) + \epsilon_{i,t} \qquad (2)$$

The Kothari et al. (2005) ROA-performance-matched-discretionary-accrual model, shown in equation (3), includes the lagged return on assets (ROA) in addition to the sales changes and gross property, plant, and equipment in the Jones (1991) model. The CFO in the Dechow et al. (1998) CFO model is replaced with the ROA in the Kothari et al. (2005) model. The

discretionary accruals in the Kothari et al. (2005) model are estimated in a manner similar to the Dechow et al. (1995) model. Therefore, our third proxy for earnings quality will be the absolute value of the residuals in equation (3) ($AQ_{i,t}^{Kothari} = |\varepsilon_{i,t}|$). Here, higher values of $AQ_{i,t}^{Kothari}$ indicate lower earnings quality:

$$\frac{TA_{i,t}}{A_{i,t-1}} = c_0\left(\frac{1}{A_{i,t-1}}\right) + c_1\left(\frac{\Delta S_{i,t}}{A_{i,t-1}}\right) + c_2\left(\frac{PPE_{i,t}}{A_{i,t-1}}\right) + c_3 ROA_{i,t-1} + \epsilon_{i,t} \quad (3)$$

Finally, to mitigate measurement errors in the individual earnings quality components and to provide evidence based on an overall earnings quality metric, we aggregate the three proxies into one score. Following Biddle et al. (2009), the aggregate score for earnings quality is calculated as the average of the standardized values of the three proxies. Thus, higher values of $EQ_{i,t}^{Aggregate}$ indicate lower earnings quality.

Model Specification

We develop an excess cash holdings model, as shown in equation (4), to determine the effect of earnings quality on corporate excess cash holdings. Please see Appendix A for a discussion on why we chose excess cash holdings over cash holdings. We modify the OPSW (1999) model to avoid potential orthogonality between the dependent variable in equation (4) and the set of independent variables used to derive the residuals in the OPSW model (A1, see Appendix A).

$$XC_{i,t} = \alpha_0 + \alpha_1 AQ_{i,t}^{Dechow} + \alpha_2 AQ_{i,t}^{CFO} + \alpha_3 AQ_{i,t}^{Kothari} + \alpha_4 AQ_{i,t}^{Aggregate} + \alpha_5 Size_{i,t} + \alpha_6 InvCF_{i,t} + \alpha_7 FinCF_{i,t} + \alpha_8 NWC_{i,t} + \alpha_9 Vol_{i,t} + \alpha_{10} RD_{i,t} \quad (4)$$

$$+\alpha_{11}L_{i,t} + \alpha_{12}Capex_{i,t} + \alpha_{13}Div_{i,t} + YearDummies + \epsilon_{i,t}$$

The excess cash holdings ratio ($XC_{i,t}$), the dependent variable in equation (4), is calculated in two ways. First, the OPSW-based excess cash holdings ratio ($XC_{i,t}^{OPSW}$) is calculated using the residuals in the OPSW model, as described in detail in Appendix A. This calculation has been used extensively in cash holdings research, such as Dittmar and Mahrt-Smith (2007), Harford et al. (2008), and Frésard and Salva (2010). Second, the DDS-based excess cash holdings ratio ($XC_{i,t}^{DDS}$) is an alternative method for calculating the excess cash holdings ratio, as described by DDS (2010). For each sample period, the sample firms are sorted into three equal-sized groups on the basis of total assets, and then into three equal-sized groups on the basis of their market-to-book ratios. Then, each observation is included in one of the nine cross-sectional groups. The median ratio of each two-digit SIC industry represents the normal cash holdings ratio for each firm within the group for that period. The DDS-based excess cash holdings ratio is then calculated as the firm's actual cash holdings ratio less the median cash holdings ratio.

In equation (4), the explanatory variables (i.e., the proxies for earnings quality) are measured in four ways. First, $AQ_{i,t}^{Dechow}$, $AQ_{i,t}^{CFO}$, and $AQ_{i,t}^{Kothari}$ are based on the Dechow et al. (1995) model, the Dechow et al. (1998) CFO model, and the Kothari et al. (2005) ROA-performance-matched-discretionary-accrual model, respectively. Then, $AQ_{i,t}^{Aggregate}$ is calculated as the average of the standardized values of the three aforementioned proxies. However, we introduce only one of the four proxies of earnings quality at a time to test the effect of earnings quality on corporate excess cash holdings. The proxies for earnings quality are expected to have positive effects on the excess cash holdings ratios, including the OPSW-based and DDS-based excess

cash holdings ratios. Because a poor earnings quality might increase adverse selection costs owing to information asymmetry—affecting the costs of external financing—firms with poor earnings quality must maintain higher excess cash holdings to finance their investment projects.

The control variables are similar to those suggested in previous studies for cash holdings, such as OPSW (1999), Dittmar and Mahrt-Smith (2007), Harford et al. (2008), Frésard and Salva (2010), Drobetz et al. (2010), Belkhir et al. (2014), and Boubaker et al. (2015b). The OPSW model is based on the notion that the level of cash holdings can be predicted by a series of firm characteristics. Firm size ($Size_{i,t}$) is expected to have a negative effect on the excess cash holdings ratio. The investment cash flow ratio ($InvCF_{i,t}$) and financial cash flow ratio ($FinCF_{i,t}$) are expected to have positive effects. Lee and Powell (2011) suggest that both investment and financial cash flows have positive effects on cash holdings. The trade-off theory posits that the net working capital ratio ($NWC_{i,t}$) has a negative effect, and volatility ($Vol_{i,t}$) is expected to have a positive effect.[1]

The R&D investment ratio ($RD_{i,t}$) is expected to have a positive effect. The trade-off theory posits that the capital expenditure ratio ($Capex_{i,t}$) and leverage ratio ($L_{i,t}$) have negative effects. John (1993) suggests that the leverage ratio can be interpreted as a proxy for debt financing ability, and thus, firms with a high leverage ratio can easily obtain capital through debt financing, which does not necessarily increase cash holdings. OPSW (1999) suggest that the dividend payout ratio ($Div_{i,t}$) negatively affect the level of cash because the distribution of dividends should reduce available cash holdings. We also include year dummies to control for year-specific effects.

Next, we develop the valuation model, shown in equation (5), and following the Dittmar and Mahrt-Smith (2007) model, to determine the effect of earnings quality on the marginal value of excess cash holdings. This valuation model was originally an ad-hoc model on the determinants of firm valuation proposed by Fama and French (1998). This valuation model was first used by Pinkowitz et al. (2006), followed by Dittmar and Mahrt-Smith (2007), and then modified by Frésard and Salva (2010), Drobetz et al. (2010), and Belkhir et al. (2014).[2]

$$MV_{i,t} = \beta_0 + \beta_1 AQ_{i,t}^{Dechow} + \beta_2 AQ_{i,t}^{CFO} + \beta_3 AQ_{i,t}^{Kothari} + \beta_4 AQ_{i,t}^{Aggregate} \quad (5)$$

$$+\beta_5 XC_{i,t} + \beta_6 (XC_{i,t} \times AQ_{i,t}^{Dechow}) + \beta_7 (XC_{i,t} \times AQ_{i,t}^{CFO})$$

$$+ \beta_8 (XC_{i,t} \times AQ_{i,t}^{Kothari}) + \beta_9 (XC_{i,t} \times AQ_{i,t}^{Aggregate}) + \beta_{10} EBIT_{i,t}$$

$$+\beta_{11} \Delta EBIT_{i,t-2,t-1} + \beta_{12} \Delta EBIT_{i,t+1,t+2} + \beta_{13} \Delta Size_{i,t-2,t-1}$$

$$+\beta_{14} \Delta Size_{i,t+1,t+2} + \beta_{15} RD_{i,t} + \beta_{16} \Delta RD_{i,t-2,t-1} + \beta_{17} \Delta RD_{i,t+1,t+2}$$

$$+\beta_{18} Int_{i,t} + \beta_{19} \Delta Int_{i,t-2,t-1} + \beta_{20} \Delta Int_{i,t+1,t+2}$$

$$+\beta_{21} Div_{i,t} + \beta_{22} \Delta Div_{i,t-2,t-1} + \beta_{23} \Delta Div_{i,t+1,t+2}$$

$$+\beta_{24} \Delta MV_{i,t+1,t+2} + YearDummies + IndustryDummies + \epsilon_{i,t}$$

The market value ratio ($MV_{i,t}$) is a measure of firm value, the dependent variable in equation (5), and is calculated as the market value of equity over net assets in year *t*. The net assets are the same as the non-cash assets, measured as total assets less cash and cash-equivalent assets in year

t, following Dittmar and Mahrt-Smith (2007). For the dependent variable, the market value of equity is normalized by net assets to control for the heteroskedasticity related to the size effect.

In equation (5), the explanatory variables are composed of four proxies for earnings quality, the excess cash holdings ratio, and four interaction terms. However, we introduce only one of the four proxies of earnings quality at a time to test the effect of earnings quality on firm value.

Four proxies for earnings quality are expected to have negative effects on firm value. Nanda and Narayanan (1999) report that poor earnings quality might aggravate the information asymmetry that causes misvaluations of bond and stock prices, and Myers and Majluf (1984) suggest that poor earnings quality makes raising external capital more expensive for firms, thereby decreasing the firm's value. Excess cash holdings ratios, including the OPSW-based and DDS-based excess cash holdings ratios, are expected to have positive effects on firm value. When a firm's earnings quality is poor, its access to capital markets might be relatively limited. Faulkender and Wang (2006) suggest that such financial constraints may cause a value less than the face value of a dollar of cash holdings to be incorporated into a firm's market value. In particular, we focus on the four interaction terms because they reflect the effect of poor earnings quality on the marginal value of excess cash holdings. Four interaction terms are expected to have negative effects on firm value. If firms with poor earnings quality accumulate cash holdings beyond the normal level that maximizes shareholder wealth, their shareholders may question the origin of the cash stockpile from an agency theory perspective. Thus, shareholders might discount the marginal value of excess cash held by such firms.

The control variables include those likely to affect investors' expectations of future cash flows that determine a firm's value. The determinants of future cash flows that Dittmar and Mahrt-Smith (2007) use as control variables are current levels, past changes, and future changes of EBIT, R&D investment, dividends, interest expenses, past and future changes of firm size, and future changes in market value—all normalized by net assets. In equation (5), $X_{i,t}$ represents the current level of X at year t, $\Delta X_{i,t-2,t-1}$ represents the past change in X from year $t-2$ to $t-1$, and $\Delta X_{i,t+1,t+2}$ represents the future change in X from year $t+1$ to $t+2$. We also include year and industry dummies to capture year- and industry-specific effects.

Importantly, agency theory predicts that managers could turn corporate excess cash holdings into their private benefits. Our research hypotheses also concern the influence of agency and information asymmetry problems on the marginal value of cash reserves not needed for operations and investments. In this regard, following Dittmar and Mahrt-Smith (2007), Frésard and Silva (2010), and Drobetz et al. (2010), we focus only on firms that hold too much cash that is easily accessible to managers. Accordingly, we estimate our value regression equation (5) for all firms with positive excess cash holdings.

Data and Descriptive Statistics

Sample firms are collected from the Korea Exchange from 2000 to 2014 using FnGuide.com and the KIS Value Library database. Firms must have complete financial reports for the sample period, because certain variables are lagged during one fiscal year. Firms in financial industries are excluded because they are subject to special financial regulations. Mergers and acquisitions

(M&A) firms are excluded because of continuity problems with the financial data. All variables are winsorized at the 1 percent level. We consider 6,025 firm-year observations for sample firms satisfying all of the aforementioned criteria for the sample period. However, the panel data are unbalanced because not all firm-year observations are available for all the sample firms during the entire sample period.

Table 1 indicates the descriptive statistics, including means, standard deviations, medians, 25^{th} percentile, and 75^{th} percentile, for all of the variables used in this study. Panel A includes the variables for determining excess cash holdings, and Panel B includes the variables for evaluating the marginal value of excess cash holdings.

As the results of Panel A indicate, the means of the OPSW-based and DDS-based excess cash holdings ratios are higher than their respective medians, implying that they are skewed to the left. The means of the four proxies for earnings quality are higher than their respective medians. The means of the financial cash flow ratio, volatility, net working capital ratio, R&D investment ratio, leverage ratio, and capital expenditure ratio are higher than their respective medians. However, the means of firm size, the investment cash flow ratio, and dividend payout ratio are lower than their respective medians. These results show that the distributions of almost all of the variables are skewed to the left.

As the results of Panel B indicate, the mean of the market value ratio is higher than its median, implying that the values are skewed to the left. The means of current levels and the past and future changes of the EBIT ratio are higher and lower than their respective medians. The means of past and future changes of firm size are higher than their respective medians. The

means of current levels and past and future changes of the R&D investment ratio are higher and lower than their respective medians. The means of current levels and past and future changes of the interest expense ratio are higher and lower than their respective medians. The means of current levels and past and future changes of the dividend payout ratio are lower and higher than their respective medians. The mean of the future change of the market value is higher than its median. These results also show that the distributions of almost all of the variables are skewed to the left.

[Insert Table 1]

Empirical Results

This study examines empirically the effect of earnings quality on excess cash holdings for firms listed in the Korean capital market using multivariate regression models. We also employ the Dittmar and Mahrt-Smith (2007) model to measure the marginal value of excess cash holdings.

Table 2 shows the results of the regression analyses conducted to examine the effect of earnings quality on corporate excess cash holdings.

[Insert Table 2]

As depicted by the results for models 1, 2, 3, and 4, the four proxies for earnings quality have significant positive effects on the OPSW-based excess cash holdings ratio at the 1 percent and 5 percent levels. The four proxies for earnings quality in models 5, 6, 7, and 8 also have significant positive effects on the DDS-based excess cash holdings ratio at the 1 percent and 5 percent levels.

These results indicate that firms with poor earnings quality increase their excess cash holdings to reduce information asymmetry. Because poor earnings quality might increase information asymmetry, firms with poor earnings quality need to maintain higher excess cash holdings to finance their investment projects. Thus, excess cash held by firms with poor earnings quality can be explained by the information asymmetry argument. Hence, these results support Hypothesis 1, which states that firms with poor earnings quality are more likely to accumulate excess cash holdings than are firms with good earnings quality.

Among the control variables, firm size has a significant negative effect on the excess cash holdings ratio at the 1 percent level. The investment cash flow ratio and financial cash flow ratio have significant positive effects at the 5 percent and 10 percent levels, respectively. This result is consistent with Lee and Powell (2011), who suggest that both investment and financial cash flows have positive effects on cash holdings. The R&D investment ratio has a significant positive effect at the 10 percent level, whereas the net working capital ratio, leverage ratio, capital expenditure ratio, and dividend payout ratio have significant negative effects at the 1 percent and 10 percent levels. These results are consistent with the studies of OPSW (1999), D'Mello et al. (2008), and Kim et al. (1998), as previously mentioned.

Table 3 shows the results for the regression analyses that we use to examine the effect of earnings quality on the marginal value of excess cash holdings.

[Insert Table 3]

As depicted by the results in models 1, 2, 3, and 4, the four proxies for earnings quality have significant negative effects on market value at the 5 percent and 10 percent levels. This indicates that firms with a poor earnings quality are discounted by their shareholders. The four proxies for earnings quality in models 5, 6, 7, and 8 are estimated similarly. This suggests that poor earnings quality might aggravate information asymmetry, which causes misvaluations of bond and stock prices, and makes raising external capital more expensive for firms, thereby decreasing firm value (Nanda and Narayanan, 1999; Myers and Majluf, 1984).

The OPSW-based excess cash holdings ratio has a significantly positive effect on firm value at the 5 percent and 10 percent levels. This indicates that the OPSW-based excess cash holdings appear to be positively related to firm value. Economically, the coefficients (β_5 = 0.116, 0.199, 0.128, and 0.086) of the OPSW-based excess cash holdings ratio indicate that one dollar of OPSW-based excess cash holdings is only valued by shareholders at \$0.116, \$0.199, \$0.128, and \$0.086, respectively. The coefficients (β_5 = 0.105, 0.202, 0.121, and 0.093) of the DDS-based excess cash holdings ratio in models 5, 6, 7, and 8 are estimated similarly. This finding is consistent with Faulkender and Wang (2006), who argue that a value less than the face value of a dollar of cash holdings may be incorporated into a firm's market value.

However, the most important results are that the interaction terms between the OPSW-based excess cash holdings ratios and the four proxies for earnings quality are significantly negative at the 5 percent and 10 percent levels. This indicates that one dollar of OPSW-based excess cash held by a firm with poor earnings quality is additionally discounted by shareholders. The interaction terms between the DDS-based excess cash holdings ratios and the four proxies for

earnings quality are similarly negative. In order to examine whether this negative effect of poor earnings quality on firm value is also economically significant, we calculate the marginal value of excess cash holdings, conditional on the level of poor earnings quality.[3] Considering the result of Model 1, the coefficient of the excess cash holdings ratio is 0.116, and that of the interaction term is -0.953. Based on the median value of $AQ_{i,t}^{Dechow}$ (0.0196; Panel A of Table 1), the market value of an additional dollar of excess cash holdings is 0.098 (=0.116–0.953×0.0196) dollar. An increase in $AQ_{i,t}^{Dechow}$ by one standard deviation (0.0631; Panel A of Table 1) results in a marginal value of excess cash that is 0.060 (=0.953×0.0631) dollar lower and, hence, the market value of an additional dollar of excess cash holdings decreases to 0.038 (=0.098–0.060) dollar. Accordingly, the negative effect of poor earnings quality on the marginal value of excess cash holdings is also economically significant.

We interpret these results as a support for Hypothesis 2, which states that firms with poor earnings quality are more likely to discount the marginal value of their excess cash holdings than are firms with good earnings quality. This finding supports the agency theory argument that managers tend to waste corporate resources by hoarding excess cash, particularly in the face of increased information asymmetry. From an agency theory perspective, firms with poor earnings quality are likely to accumulate excess cash holdings at the expense of shareholders. If shareholders appear to question the reason for such cash policy changes from an agency theory perspective, such excess cash holdings may destroy value for shareholders. This corroborates the findings of Drobetz et al. (2010), who suggest that the free cash flow theory predicts that excess cash holdings, bundled with higher information asymmetry, generates moral hazard problems,

and lead to a lower market value of a marginal dollar of cash holdings. They argue that agency costs owing to moral hazards decrease the market value of an additional dollar of cash holdings. This agency theory argument indicates that agency costs based on the free cash flow theory outweigh the benefits of cash holdings in mitigating the adverse selection costs when raising external funds.

Conclusions and Discussion

This study examines the earnings quality effect on corporate excess cash holdings and their marginal value using panel data from firms listed on the Korea Exchange from 2000 to 2014. Our main findings are as follows.

First, discretionary accruals as proxies for earnings quality have significant positive effects on corporate excess cash holdings, implying that firms with poor earnings quality are more likely to accumulate excess cash holdings than are firms with good earnings quality. This finding supports the information asymmetry argument that poor earnings quality aggravates information asymmetry and makes raising external capital more difficult and more expensive for firms. Thus, firms with poor earnings quality are likely to accumulate excess cash holdings for liquidity reserves in order to reduce information asymmetry.

Second, poor earnings quality negatively affects the marginal value of excess cash holdings, implying that firms with poor earnings quality are more likely to discount the marginal value of their excess cash holdings than are firms with good earnings quality. This finding supports the agency theory argument that managers tend to waste corporate resources by hoarding excess

cash, particularly in the face of increased information asymmetry. From the agency theory perspective, firms with poor earnings quality are likely to accumulate excess cash holdings at the expense of shareholders. If shareholders appear to question the reason for such cash policy changes from an agency theory perspective, such excess cash holdings may destroy value for shareholders. This corroborates the findings of Drobetz et al. (2010), who suggest that the free cash flow theory predicts that excess cash holdings, bundled with higher information asymmetry, generate moral hazard problems, and lead to a lower market value of a marginal dollar of cash.

Overall, our results present that poor earnings quality has a positive effect on the level of excess cash holdings and a negative effect on the marginal value of excess cash holdings. These two phenomena suggest that information asymmetry and agency problems are likely to co-exist in firms with poor earnings quality. Accordingly, we offer explanations for the phenomena based on both the information asymmetry and agency theory arguments.

Notes

1. Please see Appendix B for definitions of variables. Among the control variables used in the previous literature, the market-to-book ratio is excluded in equation (4), because it is used as a criterion for sorting sample firms to calculate the DDS-based excess cash holdings ratio.

2. Another approach to estimating the value of cash holdings (not used in this study) is the method of Faulkender and Wang (2006). They regress the cash holdings ratio (in levels and differences) on the excess stock returns.

3. For example, the partial derivative with respect to the OPSW-based excess cash holdings ratio, when the proxies for earnings quality are based on the Dechow et al. (1995) model, is computed as $\frac{\partial MV_{i,t}}{\partial XC_{i,t}^{OPSW}}$ = 0.116 – 0.953×$AQ_{i,t}^{Dechow}$. The partial derivatives with respect to the DDS-based excess cash holdings ratio are computed similarly.

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Appendix A. Excess cash estimation methodology

This appendix describes the methodology for estimating excess cash holdings. We first estimate regression models to estimate the normal level of cash holdings. This step is based on the work of OPSW (1999), which has been used extensively in the cash holdings research, such as Dittmar and Mahrt-Smith (2007), Harford et al. (2008), Frésard and Salva (2010), Belkhir et al. (2014), and Boubaker et al. (2015b). We then define the excess cash holdings as the difference between actual cash holdings and the estimated normal cash holdings.

Consistent with the trade-off theory on cash holdings, OPSW (1999) empirically estimate the normal level of cash holdings for firms as a function of their ability to access the capital market (proxied by firm size), the severity of financial constraints (cash flow), the availability of liquid asset substitutes (net working capital), hedging needs (cash flow volatility), investment opportunities (market-to-book ratio), and financial distress costs (R&D expenditures). They also extend their original model by integrating additional variables, including capital expenditure, leverage, and dividend payouts, in order to consider the implications of the pecking order theory on cash holdings. Accordingly, following the method of Belkhir et al. (2014), we estimate the OPSW-based excess cash holdings ratio as the residuals in the extended form of the OPSW (1999) model, as shown in equation (A1):

$$ln(Cash_{i,t}) = \gamma_0 + \gamma_1 ln(NA_{i,t}) + \gamma_2 CF_{i,t} + \gamma_3 NWC_{i,t} + \gamma_4 StdCF_{i,t} + \gamma_5 MTB_{i,t} \quad \text{(A1)}$$

$$+\gamma_6 RDS_{i,t} + \gamma_7 Lev_{i,t} + \gamma_8 Capex_{i,t} + \gamma_9 DivDummy_{i,t}$$

$$+IndustryDummies + \alpha_i + \mu_t + \epsilon_{i,t}$$

We define all of the variables of equation (A1) in Appendix B. We also include industry dummies, firm-fixed effects (α_i), time-fixed effects (μ_t), and error terms ($\epsilon_{i,t}$). Using these variables to estimate the normal cash level is justified by the results of previous studies.

However, equation (A1) deserves an additional comment. As noted in Dittmar and Mahrt-Smith (2007), introducing the market-to-book ratio ($MTB_{i,t}$) to the OPSW model may induce an endogeneity problem because the level of cash holdings can, in turn, determine the importance of firms' investment opportunities. For instance, Dittmar and Mahrt-Smith (2007) employ an instrumental variable approach using the three-year lagged sales growth in the OPSW model as an instrument for the market-to-book ratio. We also conjecture that it is problematic to use this variable as a proxy for investment opportunities. To address this concern, following Dittmar and Mahrt-Smith (2007), we employ the three-year lagged sales growth ($SG_{i,t-3}$) as an instrument for the market-to-book ratio.

Table A1 presents the results of the regression analyses conducted to estimate the normal level of cash holdings. OLS (1) and (2) present the ordinary least squares (OLS) results, where we do not account for the endogeneity of the market-to-book ratio. In OLS (2), we replace the market-to-book ratio with the three-year lagged sales growth as a proxy for investment opportunities. In IV (3), we apply an instrumental variables (IV) approach to estimate equation (A1).

[Insert Table A1]

We also present the results from the first-stage estimation of IV (3). The three-year lagged sales growth as an instrumental variable is significantly positively correlated with the market-to-book ratio at the 1 percent level. Furthermore, the second-stage estimation of IV (3) reassuringly shows that the market-to-book ratio, instrumented by the three-year lagged sales growth, has a significant negative effect on the cash holdings ratio at the 1 percent level. Among the other explanatory variables, the cash flow ratio, standard deviation of the cash flow ratio, and R&D intensity have significant positive effects on the cash holdings ratio at the 1 percent and 5 percent levels, while firm size, the net working capital ratio, leverage ratio, capital expenditure ratio, and dividend dummy have significant negative effects at the 1 percent and 10 percent levels. These results are generally consistent with previous related literature (Dittmar and Mahrt-Smith, 2007; Harford et al., 2008; Frésard and Salva, 2010; Belkhir et al., 2014; Boubaker et al., 2015b). Overall, our regression models used to estimate the normal level of cash holdings are statistically robust. Accordingly, we calculate the OPSW-based excess cash holdings ratio using the residuals in IV (3).

[Insert Appendix B]

Table A1. Regression results to estimate the normal level of cash holdings

Variables	Coefficients	Expected sign	OLS (1)	OLS (2)	IV (3)	First-stage estimation
Constant	γ_0		0.001 (0.36)	0.001 (0.29)	0.010 (0.87)	0.183 (1.06)
ln($NA_{i,t}$)	γ_1	-	-0.063*** (-2.88)	-0.060*** (-3.14)	-0.085*** (-3.27)	-0.150*** (-4.18)
$CF_{i,t}$	γ_2	+	0.078*** (7.60)	0.061*** (5.93)	0.102*** (9.92)	0.139*** (8.87)
$NWC_{i,t}$	γ_3	-	-0.076*** (-39.95)	-0.078*** (-40.32)	-0.065*** (-36.20)	-0.076*** (-37.42)
$StdCF_{i,t}$	γ_4	+	0.076** (2.26)	0.079** (2.22)	0.090** (2.49)	0.132** (2.43)

$MTB_{i,t}$	γ_5	-	0.009*** (11.76)		-0.006*** (-5.65)	
$SG_{i,t-3}$		+		0.005** (2.05)		0.127*** (4.85)
$RDS_{i,t}$	γ_6	+	0.049*** (10.64)	0.050*** (10.65)	0.039*** (8.22)	
$Lev_{i,t}$	γ_7	-	-0.050*** (-12.49)	-0.047*** (-11.25)	-0.074*** (-16.12)	
$Capex_{i,t}$	γ_8	-	-0.010* (-1.79)	-0.002 (-0.53)	-0.030* (-1.88)	
$DivDummy_{i,t}$	γ_9	-	-0.001 (-0.80)	-0.001 (-0.26)	-0.003** (-2.00)	

Industrydummies			Yes	Yes	Yes	No
Number of observations			6,025	6,025	6,025	6,025
Number of firms			392	392	392	392
Adjusted R^2			0.3270	0.3122		0.2285
$R^2 - Within$					0.3269	
$R^2 - Between$					0.2713	
$R^2 - Overall$					0.3100	
Lagrange multiplier test					2454.34***	
Hausman test					490.23***	
$F -$ test			381.91***	356.85***	356.51***	264.39***

Notes: This table presents the results of regression analyses conducted to estimate the normal

level of cash holdings. All of the variables are defined in Appendix B. The t-statistics that apply the corrected standard errors of White (1980) are in parentheses. The results of Lagrange multiplier test, Hausman test, and $F-$ test are also reported. ***, **, and * indicate that the coefficient is significant at the 1 percent, 5 percent, or 10 percent level, respectively.

Appendix B. Definitions of variables

Variables	Acronym	Definitions
Panel A: Variables for determining earnings quality		
Total accruals ratio	TA/A	Ratio of total accruals to total assets
Sales change ratio	$\Delta S/A$	Ratio of sales change to total assets
Account receivables change ratio	$\Delta AR/A$	Ratio of Account receivables change to total assets
PPE ratio	PPE/A	Ratio of gross property, plant, and equipment to total assets
CFO ratio	CFO/A	Ratio of cash flows from operations to total assets
ROA	*ROA*	Return on assets

Panel B: Variables for determining excess cash holdings		
OPSW-based excess cash holdings ratio	XC^{OPSW}	Excess cash holdings ratio used by OPSW(1999)
DDS-based excess cash holdings ratio	XC^{DDD}	Excess cash holdings ratio used by DDD(2010)
Proxies for earnings quality	AQ^{Dechow}	Proxy for earnings quality measure based on Dechow et al. (1995) model
	AQ^{CFO}	Proxy for earnings quality measure based on Dechow et al. (1998) CFO model
	$AQ^{Kothari}$	Proxy for earnings quality measure based on Kothari et al. (2005) ROA-performance-matched-discretionary-accrual model
	$AQ^{Aggregate}$	Aggregate score calculated as average of the standardized

		values of three proxies
Firm size	*Size*	Natural logarithm of total sales
Investment cash flow ratio	*InvCF*	Ratio of investment cash flows to net assets
Financial cash flow ratio	*FinCF*	Ratio of financial cash flows to net assets
Net working capital ratio	*NWC*	Ratio of net working capital to net assets
Volatility	*Vol*	Standard deviation of a firm's monthly stock returns for the past 12 months
Leverage ratio	*L*	Ratio of total debts to total liabilities plus market value of equity
Capital expenditure ratio	*Capex*	Ratio of capital expenditure to net assets

R&D investment ratio	RD	Ratio of R&D investment to net assets
Dividend payout ratio	Div	Ratio of cash dividend to net assets.
Panel C: Variables for evaluating the marginal value of excess cash holdings		
Market value ratio	MV	Ratio of market value of equity to net assets
EBIT change ratio	$\Delta EBIT$	Ratio of EBIT change to net assets
Firm size change	$\Delta SIZE$	Natural logarithm of total assets change
R&D investment change ratio	ΔRDA	Ratio of R&D investment change to net assets
Interest costs	ΔInt	Ratio of interest costs change to net assets

change ratio		
Dividend change ratio	ΔDiv	Ratio of dividend change to net assets
Panel D: Variables for estimating the normal level of cash holdings		
Cash holdings ratio	ln*(Cash)*	Natural logarithm for ratio of cash and cash-equivalent assets to net assets
Firm size	ln*(NA)*	Natural logarithm of net assets
Cash flow ratio	*CF*	Ratio of operating income interest minus taxes to net assets
Net working capital ratio	*NWC*	Ratio of current assets minus current liabilities minus cash and cash-equivalent assets to net assets
Standard	*StdCF*	Standard deviation of cash flow ratio for the past five years

deviation of cash flow ratio		
Market-to-book ratio	*MTB*	Ratio of total liabilities plus market value of equity to net assets. It is instrumented by three-year lagged sales growth.
Three-year lagged sales growth	$SG_{i,t-3}$	Ratio of the total sales in year *t* minus total sales in year *t*-3 to total sales in year *t*-3
R&D intensity	*RDS*	Ratio of R&D expenditures to sales
Leverage ratio	*Lev*	Ratio of total debts to total assets
Capital expenditure ratio	*Capex*	Ratio of capital expenditures to net assets
Dividend dummy	*DivDummy*	Dummy that equals one when a firm pays dividends or engages in share repurchases, and zero otherwise

Notes: This table provides the definitions of variables used in the analysis. The definitions are grouped in four categories. Panel A includes the definitions of variables for determining earnings

quality, Panel B includes the definitions of variables for determining excess cash holdings, Panel C includes the definitions of variables for evaluating the marginal value of excess cash holdings, and Panel D includes the definitions of variables for estimating the normal level of cash holdings.

Table 1. Descriptive statistics.

Panel A: Variables for determining excess cash holdings					
Variables	Mean	Std. Dev.	Median	25^{th} percentile	75^{th} percentile
$XC_{i,t}^{OPSW}$	0.0493	0.1618	0.0249	0.0058	0.1053
$XC_{i,t}^{DDS}$	0.0359	0.1387	0.0128	0.0043	0.0794
$AQ_{i,t}^{Dechow}$	0.0510	0.0631	0.0196	0.0029	0.1086
$AQ_{i,t}^{CFO}$	0.0483	0.0551	0.0206	0.0035	0.0973

$AQ_{i,t}^{Kothari}$	0.0455	0.0672	0.0198	0.0031	0.0932
$AQ_{i,t}^{Aggregate}$	0.0024	0.0352	0.0009	-0.4869	0.5179
$SIZE_{i,t}$	21.1741	8.5647	24.4046	23.5222	25.1061
$InvCF_{i,t}$	-0.0560	0.1132	-0.0320	-0.1253	0.0059
$FinCF_{i,t}$	0.0351	0.1487	0.0186	-0.0174	0.0758
$Vol_{i,t}$	0.0172	0.0856	0.0064	-0.0255	0.0472
$NWC_{i,t}$	0.1814	0.2502	0.1429	0.0058	0.2870
$RD_{i,t}$	0.0173	0.0492	0.0072	0.0006	0.0146
$L_{i,t}$	0.5744	0.7173	0.4606	0.0654	0.8265
$Capex_{i,t}$	0.0760	0.1332	0.0520	0.0073	0.1253

$Div_{i,t}$	0.0106	0.0166	0.0112	0.0006	0.0103
: Variables for evaluating the marginal value of excess cash holdings					
$MV_{i,t}$	0.4181	0.6823	0.2605	0.0029	0.5584
$XC_{i,t}^{OPSW}$	0.0493	0.1618	0.0249	0.0058	0.1053
$XC_{i,t}^{DDS}$	0.0359	0.1387	0.0128	0.0043	0.0794
$AQ_{i,t}^{Dechow}$	0.0510	0.0631	0.0196	0.0029	0.1086
$AQ_{i,t}^{CFO}$	0.0483	0.0551	0.0206	0.0035	0.0973
$AQ_{i,t}^{Kothari}$	0.0455	0.0672	0.0198	0.0031	0.0932
$AQ_{i,t}^{Aggregate}$	0.0024	0.0352	0.0009	-0.4869	0.5179
$EBIT_{i,t}$	0.0583	0.0932	0.0484	0.0001	0.1031

$\Delta EBIT_{i,t-2,t-1}$	-0.0023	0.0789	0.0004	-0.0187	0.0112
$\Delta EBIT_{i,t+1,t+2}$	-0.0044	0.0720	0.0001	-0.0167	0.0150
$\Delta \text{Size}_{i,t-2,t-1}$	0.0948	0.2221	0.0223	0.0001	0.1541
$\Delta Size_{i,t+1,t+2}$	0.0867	0.5368	0.0509	0.0001	0.1684
$RD_{i,t}$	0.0173	0.0477	0.0008	0.0001	0.0146
$\Delta RD_{i,t-2,t-1}$	-0.0010	0.0225	-0.0001	-0.0001	0.0035
$\Delta RD_{i,t+1,t+2}$	-0.0009	0.0197	-0.0001	-0.0003	0.0032
$Int_{i,t}$	0.0152	0.0178	0.0104	0.0011	0.0222
$\Delta Int_{i,t-2,t-1}$	-0.0017	0.0110	-0.0005	-0.0024	0.0003
$\Delta Int_{i,t+1,t+2}$	-0.0018	0.0101	-0.0006	-0.0033	0.0007

$Div_{i,t}$	0.0106	0.0166	0.0112	0.0006	0.0103
$\Delta Div_{i,t-2,t-1}$	0.0004	0.0197	-0.0001	-0.0004	0.0057
$\Delta Div_{i,t+1,t+2}$	0.0003	0.0152	-0.0001	-0.0003	0.0054
$\Delta MV_{i,t+1,t+2}$	0.0001	0.0228	-0.0001	-0.0022	0.0016

Notes: This table presents the descriptive statistics for all of the variables used in this study. Panel A includes the variables for determining excess cash holdings, and Panel B includes the variables for evaluating the marginal value of excess cash holdings. All of the variables are defined in Appendix B.

Table 2. Earnings quality effect on corporate excess cash holdings.

Variables	Coefficients	Expected sign	OPSW-based excess cash holdings ratio				DDS-based excess cash holdings ratio			
			Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Constant	α_0		-0.005** (-2.29)	-0.012*** (-3.18)	-0.001** (-2.40)	-0.038 (-1.60)	-0.003** (-2.45)	-0.002** (-2.39)	-0.002** (-2.11)	-0.001 (-1.15)
$AQ_{i,t}^{Dechow}$	α_1	+	0.149*** (3.17)				0.128** (2.55)			
$AQ_{i,t}^{CFO}$	α_2	+		0.131** (2.54)				0.130** (2.27)		

$AQ_{i,t}^{Kothari}$	α_3	+			0.120** (2.40)				0.122** (1.98)	
$AQ_{i,t}^{Aggrega}$.	α_4	+				0.081** (2.12)				0.089** (1.99)
$Size_{i,t}$	α_5	-	- 0.193*** (-4.37)	- 0.140*** (-3.82)	- 0.146*** (-3.11)	- 0.162*** (-2.59)	- 0.189*** (-3.63)	- 0.148*** (-3.20)	- 0.170*** (-2.80)	- 0.151*** (-2.49)
$InvCF_{i,t}$	α_6	+	0.003** (2.12)	0.007* (1.90)	0.004* (1.78)	0.003* (1.69)	0.002* (1.67)	0.004** (1.97)	0.002* (1.75)	0.006 (1.57)
$FinCF_{i,t}$	α_7	+	0.020* (1.79)	0.024* (1.74)	0.018* (1.80)	0.014* (1.71)	0.009* (1.73)	0.011* (1.68)	0.012* (1.69)	0.007* (1.68)
$Vol_{i,t}$	α_8	+	0.008	0.005	0.006	0.004	0.003	0.001	0.002	0.001

			(0.99)	(0.83)	(0.89)	(0.77)	(0.76)	(0.80)	(0.72)	(0.65)
$NWC_{i,t}$	α_9	-	-0.009* (-2.02)	-0.004* (-1.73)	-0.004* (-1.74)	-0.006* (-1.80)	-0.005* (-1.90)	-0.002* (-1.93)	-0.002* (-1.88)	-0.006* (-1.85)
$RD_{i,t}$	α_{10}	+	0.001* (1.90)	0.004* (1.95)	0.003* (1.75)	0.001 (0.88)	0.001* (1.82)	0.003* (1.66)	0.004* (1.70)	0.001 (1.03)
$L_{i,t}$	α_{11}	-	-0.010* (-1.85)	-0.009* (-1.76)	-0.008* (-1.74)	-0.029** (-2.39)	-0.006* (-1.71)	-0.009* (-1.82)	-0.003* (-1.70)	-0.015** (-2.34)
$Capex_{i,t}$	α_{12}	-	-0.001** (-1.98)	-0.002* (-1.81)	-0.003* (-1.68)	-0.001 (-1.05)	-0.001* (-1.69)	-0.001* (-1.76)	-0.001* (-1.67)	-0.001 (-1.14)
$Div_{i,t}$	α_{13}	-	-0.005*** *	-0.009*** *	-0.008*** *	-0.006* (-1.71)	-0.003*** *	-0.005*** *	-0.004*** *	-0.003* (-1.73)

			(-4.16)	(-3.76)	(-3.74)		(-3.03)	(-3.14)	(-3.09)	
YearDummies			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations			4,263	4,263	4,263	4,263	4,183	4,183	4,183	4,183
Adjusted R^2			0.1576	0.1320	0.1286	0.1264	0.1286	0.1193	0.1226	0.1186
$F-$test			158.73***	150.46***	151.56***	130.42***	139.73***	134.85***	127.40***	125.81***

Notes: This table presents the results of regression analyses conducted to examine the earnings quality effect on corporate excess cash holdings. All of the variables are defined in Appendix B. The t-statistics that apply the corrected standard errors of White (1980) are in parentheses. The result of $F-$test is also reported. ***, **, and * indicate that the coefficient is significant at the 1 percent, 5 percent, or 10 percent level, respectively.

Table 3. Earnings quality effect on the marginal value of excess cash holdings.

Variables	Coefficients	Expected sign	OPSW-based excess cash holdings ratio				DDS-based excess cash holdings ratio			
			Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Constant	β_0		-0.198 (-0.58)	-0.206 (-0.68)	-0.183 (-0.55)	-0.210 (-1.43)	-0.139 (-0.29)	-0.156 (-0.67)	-0.149 (-0.36)	-0.134 (-0.40)
$AQ_{i,t}^{Dechow}$	β_1	-	-0.309** (-2.40)				-0.294** (-2.16)			
$AQ_{i,t}^{CFO}$	β_2	-		-0.317** (-2.44)				-0.306** (-2.01)		

$AQ_{i,t}^{Kothari}$	β_3	-			-0.297** (-2.15)				-0.291** (-1.99)	
$AQ_{i,t}^{Aggregate}$.	β_4	-				-0.162* (-1.86)				-0.156* (-1.79)
$XC_{i,t}$	β_5	+	0.116** (2.01)	0.199** (2.30)	0.128** (1.98)	0.086* (1.76)	0.105** (1.98)	0.202** (2.17)	0.121* (1.80)	0.093* (1.70)
$XC_{i,t} \times AQ_{i,t}^{Dechow}$	β_6	-	-0.953** (-2.16)				-0.976** (-2.20)			

$XC_{i,t}$ $\times AQ_{i,t}^{CFO}$	β_7	-		-0.913** (-2.09)				-0.882** (-2.07)		
$XC_{i,t}$ $\times AQ_{i,t}^{Kothari}$	β_8	-			-0.776** (-1.98)				-0.805** (-1.96)	
$XC_{i,t}$ $\times AQ_{i,t}^{Aggregate}$	β_9	-				-0.429* (-1.82)				-0.436* (-1.79)
$EBIT_{i,t}$	β_{10}	+	1.056*** (3.06)	1.059** (2.53)	1.053** (2.49)	0.926** (2.04)	1.072** (2.36)	1.076** (2.40)	1.069** (2.41)	0.948** (1.98)
$\Delta EBIT_{i,t-2,t-1}$	β_{11}	+	0.806*	0.706*	0.703*	0.607*	0.839*	0.745*	0.708*	0.602*

			* (3.29)	** (2.57)	* (2.55)	* (2.42)	** (2.73)	* (2.29)	* (2.04)	* (2.18)
$\Delta EBIT_{i,t+1,t+2}$	β_{12}	+	0.637*** (2.89)	0.646*** (3.91)	0.635*** (4.30)	0.599*** (4.35)	0.628*** (4.75)	0.637*** (4.66)	0.625*** (4.48)	0.560*** (4.13)
$\Delta SIZE_{i,t-2,t-1}$	β_{13}	+	0.452*** (2.79)	0.480*** (2.97)	0.450*** (3.34)	0.519*** (2.88)	0.495** (2.41)	0.486** (2.44)	0.501** (2.46)	0.506*** (2.98)
$\Delta SIZE_{i,t+1,t+2}$	β_{14}	+	0.333* (1.67)	0.298* (1.72)	0.229* (1.71)	0.218* (1.67)	0.332* (1.69)	0.332* (1.66)	0.327* (1.73)	0.236* (1.73)
$RD_{i,t}$	β_{15}	+	0.867*** (5.06)	0.829*** (5.17)	0.906*** (5.28)	0.883*** (5.94)	0.835*** (5.19)	0.835*** (5.38)	0.899*** (5.45)	0.916*** (6.22)
$\Delta RD_{i,t-2,t-1}$	β_{16}	+	0.299*	0.308*	0.325*	0.369*	0.305*	0.384*	0.376*	0.403*

			(1.70)	(1.72)	(1.67)	(1.81)	(1.82)	(1.75)	(1.70)	(1.67)
$\Delta RD_{i,t+1,t+2}$	β_{17}		0.270* (1.68)	0.273* (1.72)	0.261* (1.67)	0.288* (1.69)	0.269* (1.72)	0.275* (1.74)	0.257* (1.66)	0.290* (1.68)
$Int_{i,t}$	β_{18}	-	-0.409 (-0.26)	-0.415 (-0.16)	-0.406 (-0.13)	-0.399 (-0.08)	-0.413 (-0.20)	-0.417 (-0.14)	-0.450 (-0.21)	-0.403 (-0.10)
$\Delta Int_{i,t-2,t-1}$	β_{19}	-	- 2.120* ** (-3.13)	- 2.158* ** (-2.90)	- 2.136* ** (-3.00)	- 1.962* ** (-2.79)	- 2.108* ** (-2.99)	- 2.143* ** (-3.12)	- 2.186* ** (-3.06)	- 2.006* ** (-2.72)
$\Delta Int_{i,t+1,t+2}$	β_{20}	-	- 1.853* * (-2.19)	- 1.906* * (-2.30)	- 1.868* * (-2.12)	- 1.805* (-1.85)	- 1.880* * (-2.24)	- 1.914* * (-2.22)	- 1.890* * (-2.17)	- 1.824* (-1.86)
$Div_{i,t}$	β_{21}	+	1.713*	1.741*	1.716*	1.553*	1.685*	1.715*	1.703*	1.568*

			** (5.05)	** (5.40)	** (5.14)	** (4.96)	** (5.23)	** (5.07)	** (5.02)	** (4.88)
$\Delta Div_{i,t-2,t-1}$	β_{22}	+	1.006*** (4.46)	1.015*** (4.76)	1.005*** (4.50)	1.001*** (4.36)	1.009*** (4.88)	1.012*** (4.72)	1.011*** (4.76)	1.016*** (4.68)
$\Delta Div_{i,t+1,t+2}$	β_{23}	+	0.997*** (4.35)	0.994*** (4.29)	0.995*** (4.31)	0.997*** (4.24)	0.993*** (4.30)	0.988*** (4.16)	0.991*** (4.27)	0.994*** (4.26)
$\Delta MV_{i,t+1,t+2}$	β_{24}	+	0.246*** (3.22)	0.249*** (3.01)	0.252*** (3.17)	0.230*** (3.12)	0.242*** (3.18)	0.247*** (2.99)	0.252*** (3.24)	0.240*** (3.28)
YearDummies			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IndustryDummies			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Number of observations	4,263	4,263	4,263	4,263	4,183	4,183	4,183	4,183
Adjusted R^2	0.1629	0.1690	0.1644	0.1595	0.1650	0.1704	0.1668	0.1602
$F-$ test	64.29***	67.52***	65.08***	60.70***	63.99***	66.50***	64.99***	61.05***

Notes: This table presents the results for regression analyses to examine the earnings quality effect on the marginal value of excess cash holdings. All of the variables are defined in Appendix B. The t-statistics that apply the corrected standard errors of White (1980) are in parentheses. The result of $F-$ test is also reported. ***, **, and * indicate that the coefficient is significant at the 1 percent, 5 percent, or 10 percent level, respectively.