Information Asymmetry and the Value of Cash*

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First Draft: February, 2007

This Draft: January, 2009

Abstract

This study investigates the market value of corporate cash holdings in connection with firm-specific and time-varying information asymmetry. Using an international sample of 7,474 firms from 45 countries over the 1995-2005 period, we empirically test two opposing hypotheses. According to the pecking order theory, asymmetric information leads to adverse selection problems and provides a value-increasing role for additional cash holdings. In contrast, the free cash flow theory predicts that excessive cash holdings bundled with asymmetric information generate moral hazard problems and lead to a lower market value of a marginal dollar of cash. We use the dispersion of analysts' forecasts as our firm-specific and time-varying measure of asymmetric information. Our results support the free cash flow theory and indicate that the value of corporate cash holdings is less in periods with a higher degree of information asymmetry. This evidence is reinforced when the sample is split according to measures for the quality of corporate governance.

Keywords: Cash holdings, value of cash, information asymmetry, analysts' forecasts

JEL classification: G32

*We would like to thank Marco Becht, Francesca Cornelli, Daniel Höchle, Ben Jann, David Yermack, Josef Zechner, and workshop participants at the University of Basel, the University of Vienna, and the CFS Summer School in Eltville 2007 for helpful comments.

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1 Introduction

J.P. Morgan economists calculated that savings by companies in rich countries increased by more than $1 trillion from 2000 to 2004. Measured against the last 40 years, companies have never hoarded so much cash as they do today.[1] A natural question to ask is which factors have led companies to accumulate such enormous amounts of cash. The standard textbook model suggests that cash holdings are irrelevant and cannot affect the value of a firm. In perfect capital markets, external finance can always be obtained at fair terms. Looking at figures from the corporate landscape, however, this irrelevancy of cash is not supported. For example, the U.S. software giant Microsoft presented a cash position amounting to $60.6 billion in its 2004 annual report. After growing investor pressure, in July 2004 Microsoft announced that it would pay a one-time dividend of $32 billion and buy back up to $30 billion of the company's stock over the next four years. Upon the arrival of that news, Microsoft's stock price rose by 5.7% in the after-trading, indicating that cash should by no means be regarded as irrelevant in investors' eyes.[2]

In order to explain corporate cash holdings, the assumptions of perfect capital markets must be relaxed. First, if transaction costs are incorporated into the model, an optimal cash balance exists and the irrelevancy of cash no longer holds. Second, if information asymmetry (henceforth referred to as IA) is taken into account, adverse selection and moral hazard problems result. Myers and Majluf (1984) model the adverse selection problem in financing decisions and consider the role of cash holdings in the presence of IA. Adverse selection induces managers to abstain from raising external capital, because they are not willing to issue undervalued securities. A cash buffer can prevent managers from being forced to pass up positive NPV projects. In contrast, Jensen (1986) analyzes the moral hazard problem and emphasizes the agency costs of free cash flow. Instead of paying out the free cash flow to the shareholders, managers waste these funds on inefficient investments or on their own pet projects (empire building).

The discussion suggests that cash holdings and IA are strongly interrelated. Therefore, one would expect that studying corporate cash holdings with an emphasis on firm-specific and time-varying IA provides valuable insights about a firm's motivations to hold cash. This is the novel path that our study takes and how it contributes to the literature. The previous literature on cash holdings can loosely be divided into two different strands. The first strand examines the determinants of cash holdings and whether there exists an optimal level of cash. The second strand focuses directly on the impact of liquidity on firm performance and firm valuation. Our own study belongs to this second category. Potentially, it would be interesting to follow the first path and analyze how the level of a firm's cash reserves are influenced by IA. However, it is virtually impossible to unambiguously interpret any empirical findings. On the one hand,

[1] J.P. Morgan Research: Corporates are driving the global saving glut, June 24, 2005.

[2] The Wall Street Journal, Microsoft to Dole Out its Cash Hoard, July 21, 2004, p. A.1.

the pecking order theory suggests that financial slack is valuable and, hence, a firm should hold more cash when the degree of IA is higher. On the other hand, this same argument is especially important for firms with large investment opportunities, and according to the pecking order theory these firms use cash in the first place. Therefore, completely opposite predictions for the influence of IA on the level of cash can be derived. The free cash flow hypothesis also leads to ambiguous predictions. One could argue that firms with a higher degree of IA hold more cash, because managers are reluctant to distribute excess cash to shareholders. In contrast, more pronounced IA could also result in lower cash holdings, because managers are able to dissipate cash. Due to these difficulties to formulate clear predictions, we follow the second strand of the literature and investigate the influence of IA on the *value* of cash rather than on the *level* of cash. Specifically, we study the marginal value of cash in the presence of firm-specific and time-varying IA.

Although previous studies already investigated the value consequences of corporate cash holdings, they put their emphasis on corporate governance issues rather than on IA. These studies document that a weak corporate governance regime has detrimental effects on the value of cash (Dittmar et al., 2003; Pinkowitz et al., 2006; Dittmar and Mahrt-Smith, 2007). In this paper, we focus on firm-specific and time-varying IA and its impact on the market value of cash. We test whether in periods with a higher degree of IA cash holdings contribute more or less to firm value than in periods with a lower degree of IA. On the one hand, a positive relationship would support Myers and Majluf's (1984) hypothesis that external finance is costly and cash provides a valuable buffer. On the other hand, a negative relationship would be consistent with Jensen's (1986) notion that increased managerial discretion induces managers to squander corporate liquidity. We test these two hypotheses and investigate which effect outweighs the other. Our sample contains 7,474 firms from 45 countries over the period from 1995 to 2005. The dispersion of analysts' earnings forecasts serve as our main proxy for IA. We use both the actual cash ratio and an estimated metric labeled 'excess cash' to compute the impact on firm valuation in connection with firm-specific and time-varying IA. Our results are based on fixed effects estimations and the Fama-MacBeth procedure.

Our results reveal that the value shareholders place on the marginal value of cash (without considering IA) is around one dollar, on average. However, the marginal value of cash decreases significantly when IA is incorporated. This evidence provides a corroboration of Jensen's (1986) free cash flow theory, i.e., the costs from holding cash (creating moral hazard problems) outweighs its benefits (avoiding costly external finance). In order to distinguish more precisely between the two opposing hypotheses, we split the sample according to measures for the quality of corporate governance as well as financial constraints. We document that the value of cash is higher if corporate governance is better, which reinforces the free cash flow hypothesis. The results for our sample sorts based on financial constraints do not allow clear-cut conclusions. As a robustness test, following Opler et al. (1999), we derive a measure for 'excess cash' and use it in the valuation regressions instead of the actual cash ratio. Our results remain qualitatively the same for this alternative metric.

Taken together, our findings have important implications. We are unable to support the hypothesis that financial slack is valuable, as it is predicted by the pecking order theory. Our findings indicate that it is not in the shareholders' interest that firms hoard liquidity due to problems induced by IA. The precautionary motive to hold cash appears to be questionable. However, these findings do not contradict the pecking order theory in general. We do not suggest that firms should not use internal funds in the first place before external funds are raised. Instead, we rather argue that it is not optimal for firms to accumulate cash with the intention to avoid (costly) external finance in future states when IA is high.

The remainder of this paper is as follows. Section 2 introduces the theoretical background, present our hypotheses, and reviews the related literature. Section 3 describes the data and presents the methodologies we use in our empirical study. Section 4 reports the results and shows various robustness tests. Finally, section 5 provides concluding remarks and suggestions for further research.

2 Theoretical Background, Hypotheses, and Related Literature

2.1 Theoretical Background and Hypotheses

According to the pecking order theory (Myers, 1984; Myers and Majluf, 1984), firms prefer internal to external finance. This theory is based on the assumption that corporate insiders are better informed than shareholders. Due to IA managers could be forced to forgo positive NPV projects if internal funds are not sufficient to finance the optimal investment program. In this situation, financial slack is valuable. In the Myers and Majluf (1984) model, the only opportunity to issue stock without loss of market value occurs if IA is nonexistent or at least negligibly small. This idea describes the notion of time-varying adverse selection costs.[3] According to this hypothesis, there are states in which firms are not restricted in their access to external capital and other states in which external finance is prohibitively costly. If external finance is prohibitive, financial slack is especially important and an additional unit of cash will presumably have a higher value. This reasoning results in our first hypothesis:

Hypothesis 1: In periods with a higher degree of IA cash has *more* value for a firm than in periods when the degree of IA is lower.

[3] The idea of time-varying IA is implemented in the models of Viswanath (1993) and Korajczyk et al. (1992). They show that it can be optimal for a firm to deviate from a strict pecking order rule and to finance a new investment project with new equity even if there are other financial resources available.

Based on Jensen's (1986) free cash flow theory, however, the opposite relationship could be expected. Internal funds allow managers to shield themselves away from the rigor of the capital market. In this case, they do not need the approval of capital providers and are free to decide according to their own discretion. As managers are generally reluctant to pay out funds, they have an incentive to invest even when there are no positive NPV projects available. With increasing managerial discretion to use funds for value-destroying projects when cash reserves are high, there are limitations to self-serving behavior due to corporate governance mechanisms, e.g., the market for corporate control (Stulz, 1988). However, the higher the degree of IA, the more difficult it becomes for outsiders to distinguish between value-destroying and optimal investments. Specifically, shareholders may be unable to determine whether high cash reserves are based on an optimal liquidity management or whether they are the result of managerial risk aversion (Fama and Jensen, 1983). This reasoning boils down to our second hypothesis:

HYPOTHESIS 2: In periods with a higher degree of IA cash has *less* value for a firm than in periods when the degree of IA is lower.

Empirical test of these two hypotheses involve three major difficulties:

(i)*How to disentangle the effects of the two conflicting hypotheses?* The two hypotheses contain opposing expectations concerning the influence of IA on the value of cash. If no relationship can be detected, it cannot be ruled out that both effects are at work and cancel each other out. Even if a relationship can be detected, it still cannot be ruled out that the opposite effect is also existent, albeit to a lesser degree. Although we are ultimately interested in the overall (net) effect, we attempt to disentangle these two effects by splitting our sample into subgroups. The first hypothesis is strongly related to the access to external finance. Splitting the sample according to the degree of financial constraints, one would expect that in the subsample encompassing constrained firms the value of cash is higher when the degree of IA is also high. This finding would support our hypothesis 1, regardless of the overall (net) effect. In contrast, our hypothesis 2 will presumably be more relevant for firms with weaker corporate governance structures. Splitting the sample according to this criterion, the value of cash in combination with a high degree of IA is presumably lower in the subgroup of firms with weaker governance structures. This finding would support our hypothesis 2, regardless of the overall (net) effect.

(ii) *How to measure firm-specific and time-varying IA?* To analyze the relationship between the value of cash and time-varying IA, a reliable firm-specific proxy for IA is required. We choose two measures that were used in the previous research and are meanwhile well-established: (1) the dispersion of analysts' forecasts is used in our main model specification, and (2) analysts' forecast errors are used in a robustness test. A detailed discussion of both proxy variables is provided in section 3.1.1.

(iii) *How to measure the value of cash?* While our study represents, to the best of our knowledge, the first that investigates the influence of IA on the value of cash, it is not the first one that analyzes the value of cash in different settings. Fama and French (1998) study the impact of debt and dividends on firm value. Pinkowitz et al. (2006) modify their regression model to estimate the marginal value of cash. Dittmar and Mahrt-Smith (2007) also use a modified version of the Fama and French (1998) method to estimate the impact of cash on firm value. Specifically, they estimate the value of liquidity in relation to a firm's corporate governance system. In our empirical analysis, we also adapt the Fama and French (1998) valuation regression to test the impact of IA on the value of cash. A comprehensive description of the different methods we use is provided in section 3.2.

2.2 Related Literature

There is a growing literature that investigates the value of a marginal dollar (Pinkowitz et al., 2006; Dittmar and Mahrt-Smith, 2007; Faulkeneder and Wang, 2006). These papers are related to our work as they also study the value of cash. However, their theoretical framework is different from ours. They do not analyze the relationship between the value of cash and firm-specific and time-varying IA. Nevertheless, there are several other papers that are related to our research question. In this section, we refer to studies that (i) find evidence for the pecking order theory in the presence of time-varying adverse selection costs (background of our hypothesis 1), (ii) empirically test the free cash flow hypothesis (background of our hypothesis 2), or (iii) examine a related question based on these two propositions.

Autore and Kovacs (2006) provide evidence that firms prefer to access financial markets and issue equity when the level of IA is low. They document support for the pecking order theory when time-varying adverse selection costs are included into the model. Given their findings, one would expect that cash is more important for firms and have a higher market value in periods when IA is more pronounced. In contrast, Leary and Roberts (2007) report that the pecking order theory is not able to explain firms' financing decisions even in states when information IA is high. Different measures of IA could be an explanation for these contradictory findings. While Autore and Kovacs (2006) use a firm-specific and time-varying proxy for IA, Leary and Roberts (2007) rely on an aggregated proxy based on 'hot' (high equity issuance) and 'cold' (low equity issuance) stock market periods.[4]. We suggest that it is of crucial importance to measure IA on a firm-level basis, because IA presumably does not behave in the same way over time for all firms.

[4] This latter method follows previous work by Choe et al. (1993)

Nohel and Tarhan (1998) investigate the impact of share repurchases on operating performance. Their empirical findings reveal that operating performance improves after share repurchases, but only for firms that have low growth opportunities. Contrary to what one would expect, the improved performance following a share repurchase does not result from better growth opportunities but rather from the more efficient employment of assets. The authors conclude that their findings can best be explained by the free cash flow hypothesis. Dittmar et al. (2003) provide more direct evidence on the agency costs of managerial discretion in connection with corporate cash holdings. They study more than 11,000 firms from over 45 countries and document that firms in countries with a low level of investor protection hold double the amount of cash when compared to firms in countries with a high level of shareholder rights. Their results become even more pronounced when they control for the capital market development. In countries with a low level of investor protection, shareholders simply lack the means to force managers to distribute cash. Overall, Dittmar et al. (2003) argue that their findings support the free cash flow hypothesis. Pinkowitz and Williamson (2004) also focus on the influence of country-level investor protection on the value of cash holdings. Their findings reveal that cash is worth less in countries where minority shareholder rights are weaker. Similarly, Kalcheva and Lins (2006) document that firms with weak corporate governance structures at the corporate level hold more cash, and this effect becomes stronger for firms in countries with a low level of investor protection. Taken together, these studies suggest that poor protection of investor rights at the firm-level as well as at the country-level make it easier for managers to dissipate cash for their own ends.

The paper by Lundstrum (2003) is closely related to our study as it explicitly focuses on IA. He tests whether the benefits from accessing an internal capital market in order to avoid selling underpriced securities outweigh the agency costs created by the availability of liquid resources. On the one hand, building on Williamson's (1986) information cost theory, Lundstrum (2003) argues that internal capital markets have a positive effect on firm value for two reasons. First, firms do not have to sell undervalued securities if IA masks the true value of the shares. Second, internal capital markets allow managers to undergo investments that the capital market would be unwilling to finance, because IA hinders managers to convey their informational advantage credibly to the market. On the other hand, the free cash flow theory predicts that more liquid funds at the manager's discretion lead to agency costs due to money squandering. An internal capital market presumably increases liquid assets and amplifies the resulting agency costs. Lundstrum's (2003) results reveal that although access to an internal capital market exerts a positive effect on firm value, this effect only shows up for firms with a low level of IA. In the case of pronounced IA, there are no gains from the availability of an internal capital market. This observation corroborates the free cash flow theory.

3 Data and Empirical Methodology

Our regression specifications are based on the method proposed by Fama and French (1998). They investigate how firm value is related to dividends and corporate debt. Pinkowitz and Williamson (2004), Pinkowitz et al. (2006), and Dittmar and Mahrt-Smith (2007) use a modified version of this approach to estimate the value of cash holdings. We also employ a modified version of the Fama and French (1998) valuation regression in our empirical analysis. This approach requires variables on firm characteristics. First, we need data on firm value and cash holdings. Second, we require various control variables to avoid an omitted variables bias. All variables used in our empirical analysis are described in section 3.2, where we also explain the empirical methodology. Most important, to investigate the influence of IA on the value of cash, we need a measure for the level of IA. This metric is explained in section 3.1.1. Section 3.1.2 describes our international sample, and in section 3.1.3 we present our sample splits that are used to test for the influence of financial constraints and the corporate governance structure on the value of cash in conjunction with firm-level and time-varying IA.

3.1 Data Description

3.1.1 Measures of Information Asymmetry

Choe et al. (1993) use announcement effects to measure the level of IA. Announcements presumably reveal information to the market. On the one hand, a lower price reaction indicates that market participants are less surprised by the news, i.e., the level of IA was low. On the other hand, a lower reaction could indicate that corporate actions possess low signaling power, also indicating that the level of IA was low. The main disadvantage of announcement effects as a proxy for IA is that they can only be measured discretely at the time of an announcement and not continuously on a firm-level basis.

Alternatively, previous studies use size (Ozkan and Ozkan, 2004) or the market-to-book ratio (Frank and Goyal, 2003) as a proxy for IA. Large firms are better monitored and more information is publicly available. Growth opportunities entail more uncertainty about the future state of the firm. However, as emphasized by Autore and Kovacs (2005), both size and growth opportunities are only useful in capturing the cross-sectional variation among firms rather than the time series variation of IA for each firm. Accordingly, the use of these variables as proxies for IA can nullify the advantages of having panel data.

Other proxies are capable to capture both the cross-section and the time series variation of IA. Krishnaswami and Subramaniam (1999) discuss five different proxies that are frequently used in empirical corporate finance studies: the volatility of abnormal returns around earnings announcements, the volatility of daily stock returns, the errors in analysts' forecasts, normalized forecast errors, and the standard deviation of analysts' forecasts. The return volatility around earnings announcements is not a feasible measure of IA in a cross-country study. The volatility of stock returns does not allow to distinguish between risk in a broader sense and the effect of IA. The errors in analysts' forecasts capture the difference between the mean forecasts and the actual earnings per share. Krishnaswami and Subramaniam (1999) argue that the errors in analysts' forecasts are an especially appropriate proxy for IA. Earlier work by Elton et al. (1984) provides evidence that most of the forecast error in the last month of the fiscal year can be explained by misestimation of firm-specific factors rather than by misestimation of economy-wide or industry factors. Therefore, we use this measure as a proxy for IA. Since this variable could still be influenced by risk, Krishnaswami and Subramaniam (1999) divide the errors in analysts' forecasts by the volatility of the firm's quarterly earnings. This approach delivers normalized forecast errors. Because we do not have quarterly data for most countries in our sample, we cannot apply this correction for risk and use the errors in analysts' forecasts (without normalization) only in a robustness test in section 4.3.

In our main model specifications, we choose the dispersion of analysts' forecasts as our proxy for IA. This variable measures the standard deviation of the forecasts across different analysts. Greater disagreement across analysts presumably indicates a higher level of IA. Most important, Diether et al. (2002) provide evidence that the dispersion of analysts' forecasts is not merely a proxy for risk.[5] Several studies confirm this relationship between the dispersion of analysts' forecasts and the level of IA. For example, Parkash et al. (1995) analyze the relationship between firm-specific attributes and the uncertainty in analysts' earnings predictions. They document that the amount and quality of information available about a firm significantly influence the volatility of the earnings forecasts. D'Mello and Ferris (2000) report stronger announcement effects for firms whose forecasts exhibit lower dispersion. Finally, Autore and Kovacs (2006) also use analysts' forecasts as their proxy for IA.[6] They report that firms avoid to access financial markets in periods with a high degree of IA.[7]

5 Observing a negative relationship between analysts' dispersion and future stock returns, they argue that dispersion cannot proxy for risk. We control for this relationship in the robustness tests in section 4.3.

6 The proxy for IA used by Autore and Kovacs (2006) is also based on dispersion, but they compute the variable in a different way. Specifically, they divide the dispersion in a given quarter by the average of the dispersion in the prior four quarters to capture the time series variation of dispersion rather than the cross-sectional variation. Since we have no quarterly data for most of our firms, we cannot divide dispersion by an average of prior dispersion. If we used the values of the prior years instead of the prior quarters, we would lose too many observations. However, focusing on the within-dimension in a fixed effects model, our estimations are also based on the time-variation of IA. In a robustness test, Autore and Kovacs (2006) also use the unscaled dispersion and estimate a fixed effects model. Their results remain qualitatively the same.

7 Krishnaswami and Subramaniam (1999) use two additional measures for IA, which we do not use in our study. First, they look at the stock market reaction to the announcement of quarterly earnings. We cannot use this variable due to data limitations. Second, they use the residual volatility of stock returns as a proxy for IA. The main problem with this variable is that one cannot distinguish between the effect of risk in general and the effect of IA. Another variable that is sometimes used to proxy for IA is the number of analysts covering a firm (Lundstrum, 2003). We choose not to use this variable, because we consider it more as a proxy for firm size rather than for IA.

To compute the dispersion of analysts' forecasts, we use the one-year consensus forecasts of the earnings per share provided by I/B/E/S. Firm observations are excluded if the standard deviation of the forecasts is not based on the estimates of at least three analysts. The dispersion of these forecasts (defined as the firm-level standard deviation of all forecasts across the various analysts) is not updated each month for every firm. If we took the data only for one specific month, we would loose all firm-year observations for which no (updated) estimate for this particular month is available. Therefore, we calculate the average of the monthly dispersions for each year.[8] In order to make this measure comparable across different firms, the standard deviation of the forecasts needs to be scaled. This is usually done by dividing the standard deviation either by the stock price, the absolute value of the mean forecast, or the absolute value of the median forecast. As our dependent variable (firm value) is related to the stock price, we do not use the stock price for scaling and rather divide by the median forecast to avoid an endogeneity problem.[9] By adding one to this measure and taking the natural logarithm, our measure converges to a normal distribution. Therefore, our proxy for IA is:

$$dispM = \ln\left(1 + \frac{Standard\,deviation\,of\,analysts'\,forecasts}{|Median|}\right) \quad (1)$$

where the standard deviation is the mean of the standard deviations taken over the entire year. A more detailed version of this formula is presented in the appendix. The descriptive statistics of this variable is provided in Table 2 in section 3.2.1.

3.1.2 The Sample

Our data set covers the period from 1995 to 2005. All firms from the different countries are included for which I/B/E/S provides analysts' forecasts and for which we can retrieve company data from Worldscope.[10] We use yearly data, because for most countries quarterly accounting data are not available. Moreover, because of the specific nature of their business, financial firms and utilities are omitted from the sample. In order to ensure comparative data, firms whose fiscal year does not end with the calendar year are excluded. To reduce the impact of outliers, we trim all variables at the 1% and the 99% tails.

8 Towards the end of each year dispersion decreases, because unexpected events become less probable and uncertainty is resolved. Since we do not have the dispersion for each firm in every month, this average could underestimate the dispersion of firms for which we have no observations in the first months of the year. Therefore, as a robustness check, we compute the average dispersion using only a few months. For January and February, forecasts are only available for a small portion of our sample firms, and dispersion varies widely. When we only use the average of the dispersion in March, April, and May of a given year, our results do not change qualitatively.

9 Our results do not qualitatively change if the mean is used instead of the median.

10 If the variable *dispM* cannot be calculated for at least one year, this firm is excluded from our analysis.

Finally, we exclude countries with fewer than 30 firm-year observations. In the most basic specification, our (unbalanced) sample consists of 7,474 firms and 42,746 firm-year observations from 45 countries.

3.1.3 Variables Used to Divide the Sample into Subgroups

We divide our sample into several subgroups in order to test whether corporate governance structures and financial constraints have an impact on the way IA influences the value of cash. This approach allows us to better differentiate between hypothesis 1 (related to costly external finance due to adverse selection) and hypothesis 2 (related to the free cash flow problem). Table 1 contains a list of the countries contained in our sample together with the descriptive statistics of the variables that are measured at the country level. The following variables are used to split the sample into subgroups in order to investigate the influence of corporate governance (using median-splits where applicable):

Rule of law index: Among other things, the rule of law index captures the extent to which agents have confidence in the rules of society, the quality of contract enforcement, and the courts. It is generally assumed that firms in countries with a lower rule of law index work under weaker corporate governance structures. This variable is provided by the Worldbank. We use the index for the year 2000, i.e., the year in the middle of our sample period.

Corruption index: The corruption index measures the extent to which public power is used to extract private gains in different countries. Generally, firms in countries with a higher extent of corruption exhibit weaker corporate governance structures. This variable is also provided by the Worldbank, and we use the index for the year 2000.

Anti-director-rights index: This index is an aggregated measure for the level of shareholder rights in a country. It is taken from the data provided on the website of Rafael La Porta.[11] A detailed description of the construction of this index can be found in La Porta et al. (1998). Again, we use the index for the year 2000.

Legal system: Countries can be classified according to their different law traditions. While civil law is based on a series of written codes or laws, common law is developed by custom. La Porta et al. (1998) document that in common law countries minority shareholders are better protected against expropriation by insiders compared to civil law countries. The legal system classification is again taken from the data provided on the website of Rafael La Porta.

[11] http://mba.tuck.dartmouth.edu/pages/faculty/rafael.laporta/publications.html.

Closely held shares: While the previous variables are only available at the country level, we also use one variable that can be measured at the firm-level. Specifically, we collect the percentage of shares held by corporate insiders. Time series data is taken from Worldscope. For sample splits that are based on this variable, we use various cut-off levels (see section 4.1).

In order to investigate the influence of financial constraints, the following variables are used to split the sample into subgroups (again using median-splits where applicable):

Stock market capitalization to GDP: This variable is computed as the ratio of the value of listed shares in a country to its gross domestic product. We expect countries with a higher ratrio to have a higher developed capital market. Accordingly, firms in these countries should have better access to capital, i.e., they are less constrained. This variable is provided on the website of Ross Levine.[12] We use the values for the year 2000, i.e., the year in the middle of our sample period.

Private bond market capitalization to GDP: This variable is computed as the ratio of a country's private domestic debt securities (issued by financial institutions and corporations) to its gross domestic product. A higher ratio is interpreted as firms in a country being less constrained. The data is also provided on the website of Ross Levine, and the values are for the year 2000.

Firm size: While the previous two measures are only available at the country level, using firm size as a proxy for the extent of financial constraints allows us to divide the sample at a firm-level basis. According to Almeida et al. (2004), small firms tend to be constrained. Firm size is measured by the firm's market capitalization and is derived as a time series from Worldscope.

Payout ratio: As a final proxy for financial constraints, we use the payout ratio. This variable is measured at the firm-level and is defined as the ratio of total dividends and share repurchases to operating income. Almeida et al. (2004) suggest that firms with a small payout ratio tend to be constrained. Time series data are taken from Worldscope.

A limitation is that there is not always a clear-cut distinction between the variables that are used to split the sample according to the corporate governance structure and those that are used to differentiate the sample according to financial constraints. For instance, the legal system is used as a proxy for the strength of the corporate governance structure. At the same time, civil law countries generally have smaller and narrower capital markets (La Porta et al., 1998), i.e., the legal system could also be associated with the degree of financial constraints.

[12] www.econ.brown.edu/fac/Ross_Levine/Publications.htm

3.2 Empirical Methodology

In the recent empirical cash literature, three different approaches have been pursued to estimate the value of cash. We focus on the approach of Pinkowitz et al. (2006) as our main regression specification. To check the robustness of our results, we build on the approach of Dittmar and Mahrt-Smith (2007).[13] The following sections describe these two methods in more detail and show how we extend them to estimate the impact of firm-specific and time-varying IA on the market value of cash.

3.2.1 The Approach by Pinkowitz, Stulz, and Williamson (2006)

The starting point is the valuation model in Fama and French (1998), who examine the influence of debt and dividends on firm value. Their basic regression specification is:

$$\begin{aligned}(V_t - A_t) = \alpha &+ \beta_1 E_t + \beta_2 dE_t + \beta_3 dE_{t+2} + \beta_4 dA_t + \beta_5 dA_{t+2} + \beta_6 RD_t \\ &+ \beta_7 dRD_t + \beta_8 dRD_{t+2} + \beta_9 I_t + \beta_{10} dI_t + \beta_{11} dI_{t+2} + \beta_{12} D_t \\ &+ \beta_{13} dD_t + \beta_{14} dD_{t+2} + \beta_{15} dV_{t+2} + \varepsilon_t\end{aligned} \tag{2}$$

with:

V_t:	Total market value of the firm (market value of equity plus book value of debt)
A_t:	Book value of total assets
E_t:	Earnings before interest and extraordinary items (but after depreciation and taxes)
RD_t:	R&D expenditures
I_t:	Interest expenses
D_t:	Total dividends paid
dX_t:	Past two-year change of the variable X, i.e., $X_{t-2} - X_t$
dX_{t+2}:	Future two-year change of the variable X, i.e $X_t - X_{t+2}$

All variables are scaled by total assets (A_t). The dependent variable is the spread of value over cost. The control variables (in levels and differences) are included into the model to capture expectations about future earnings and other effects that potentially influence the value of the firm. To estimate the value of cash, Pinkowitz et al. (2006) modify this equation in three respects. First, they split up the change in assets into its cash and non-cash components. Second, they use V_t (scaled by A_t) as the dependent variable. This allows them to interpret the coefficient on cash as the market value of one dollar (i.e., the marginal value of cash). And third, they use one-year differences instead of two-year differences, implying

[13] The approach that is not used in this study is the method of Faulkeneder and Wang (2006). They regress the cash ratio (in levels and differences) on excess stock returns.

that fewer observations are lost. Taken together, to estimate the relationship between market value and cash holdings, Pinkowitz et al. (2006) use the following regression specification:

$$\begin{aligned} V_t = {} & \alpha + \beta_1 E_t + \beta_2 dE_t + \beta_3 dE_{t+1} + \beta_4 dNA_t + \beta_5 dNA_{t+1} + \beta_6 RD_t \\ & + \beta_7 dRD_t + \beta_8 dRD_{t+1} + \beta_9 I_t + \beta_{10} dI_t + \beta_{11} dI_{t+1} + \beta_{12} D_t + \beta_{13} dD_t \\ & + \beta_{14} dD_{t+1} + \beta_{15} dV_{t+1} + \beta_{16} dC_t + \beta 17 dC_{t+1} + \varepsilon_t \end{aligned} \tag{3}$$

with:

NA_t: Net assets (book value of total assets minus cash)

C_t: Cash

dX_t: Past one-year change of the variable X_t, i.e., $X_{t-1} - X_t$

dX_{t+1}: Future one-year change of the variable X, i.e., $X_t - X_{t+1}$

The most important coefficient is β_{16}, which measures the contribution of changes in cash holdings to firm value. The original Fama and French (1998) valuation model includes lead variables as proxies for expectations. However, an increase in cash holdings could also change expectations about future growth. Therefore, Pinkowitz et al. (2006) use an alternative specification, where they include the level of cash instead of the differences:

$$\begin{aligned} V_t = {} & \alpha + \beta_1 E_t + \beta_2 dE_t + \beta_3 dE_{t+1} + \beta_4 dNA_t + \beta_5 dNA_{t+1} + \beta_6 RD_t \\ & + \beta_7 dRD_t + \beta_8 dRD_{t+1} + \beta_9 I_t + \beta_{10} dI_t + \beta_{11} dI_{t+1} + \beta_{12} D_t + \beta_{13} dD_t \\ & + \beta_{14} dD_{t+1} + \beta_{15} dV_{t+1} + \beta_{16} C_t + \varepsilon_t \end{aligned} \tag{4}$$

With this equation, the coefficient on the level of cash, β_{16}, measures the sensitivity of firm value to a one-dollar increase in cash holdings. Provided that the impact of a change in cash holdings on future cash flows is captured by the variables in the Fama and French (1998) model that capture expectations, the coefficient on cash holdings is an estimate of the market value of a marginal dollar of cash. We use this second approach as our main regression specification, but we also employ the first approach as a robustness test. As specified in our hypotheses in section 2.1, we are ultimately interested in the value of cash in connection with firm-specific and time-varying IA. In order to measure this effect, an additional interaction term is included into the model. This variable is calculated by multiplying the cash level (C) by the dispersion of analysts' forecasts ($dispM$). Additionally, the variable $dispM_{i,t}$ itself is used as an explanatory variable to control for a direct influence of IA on firm value. We use a fixed effects estimator in order to focus on the within-dimension of the data. To control for macroeconomic effects, we include time dummy variables into the model. This results in our final model, where α_i and μ_t denote entity- and time-fixed effects:

$$\begin{aligned} V_{i,t} = \alpha &+ \beta_1 E_{i,t} + \beta_2 dE_{i,t} + \beta_3 dE_{i,t+1} + \beta_4 dNA_{i,t} + \beta_5 dNA_{i,t+1} \\ &+ \beta_6 RD_{i,t} + \beta_7 dRD_{i,t} + \beta_8 dRD_{i,t+1} + \beta_9 I_{i,t} + \beta_{10} dI_{i,t} + \beta_{11} dI_{i,t+1} \\ &+ \beta_{12} D_{i,t} + \beta_{13} dD_{i,t} + \beta_{14} dD_{i,t+1} + \beta_{15} dV_{i,t+1} + \beta_{16} C_{i,t} \\ &+ \beta_{17} (C \times dispM)_{i,t} + \beta_{18} dispM_{i,t} + \alpha_i + \mu_t + \varepsilon_{i,t} \end{aligned} \tag{5}$$

The main coefficient of interest is β_{17}. This coefficient on the interaction term measures the market value of a marginal dollar of cash in connection with firm-specific and time-varying IA. A positive coefficient supports our hypothesis 1 (related to the pecking order theory), a negative one supports our hypothesis 2 (related to the free-cash flow theory).

Statistical inference of the model is based on Driscoll and Kraay (1998) standard errors. These standard errors are robust to very general forms of cross-sectional and temporal dependence.[14] Alternatively, we also estimate the model using the Fama-MacBeth approach. While this method is commonly used in the empirical corporate finance literature, Peterson (2006) forcefully shows that it cannot control for cross-sectional dependence. The descriptive statistics of all variables that are used in the model are presented in Panel A of Table 2.[15] The values are very similar to those presented in Pinkowitz and Williamson (2004).

3.2.2 The Approach by Dittmar and Mahrt-Smith (2007)

As a robustness test, we adapt the approach of Dittmar and Mahrt-Smith (2007) in order to measure the influence of cash on firm value in connection with firm-specific and time-varying IA. Their model is not used as our main specification for two reasons. First, our hypothesis 1 is based on the pecking order theory. In a strict pecking order world, there is no cash optimum. This alternative approach, however, requires to calculate 'excess cash' as the deviation from a target cash level. Second, the calculation of 'excess cash' requires variables that are not available for all firms, which reduces our sample size.

Dittmar and Mahrt-Smith (2007) also take the Fama and French (1998) valuation regression as their starting point. However, instead of including the actual cash level (or the difference) as the independent

[14] Höchle (2007) shows in a Monte Carlo simulation that the finite sample properties of Driscoll and Kraay's nonparametric covariance matrix estimator are significantly better than those of commonly used alternatives if cross-sectional dependence is present.

[15] Following Pinkowitz and Williamson (2004), but in contrast to Pinkowitz et al. (2006) and in Fama and French (1998), the dividend payments capture total payouts and include share repurchases.

variable, the level of 'excess cash' must be calculated in a first step. In fact, estimating the model requires a two-step procedure. In a first step, the normal level of cash is predicted following the specification suggested by Opler et al. (1999). The residuals from this predictive regression, i.e., the difference between the actual and the predicted cash level, are defined as 'excess cash'. In a second step, the valuation regression is run using this excess cash measure instead of the level of cash as an explanatory variable.

Excess cash refers to the amount of cash holdings that can neither be justified based on the transaction cost motive nor the precautionary motive. The first hypothesis suggests that a certain level of cash is necessary in order to economize on transaction costs (Keynes, 1936; Miller and Orr, 1966). Transaction costs are determined by firm characteristics that either increase the probability and economic costs of cash shortfalls and/or increase the costs of raising external funds. In order to control for this effect, Opler et al. (1999) and Dittmar and Mahrt-Smith (2007) include net assets (total assets minus cash), net working capital, and a proxy for cash flow volatility as control variables in their predictive regressions. The second hypothesis suggests that cash is held due to the precautionary motive. It is built on the premise that financial slack is valuable if growth opportunities are high and external finance is prohibitively costly due to adverse selection problems (Myers and Majluf, 1984). Accordingly, we control for investment opportunities (market-to-book ratio), cash flow, and access to external capital as measured by firm size (book value of assets in U.S. dollars as of year 2000). As suggested by Dittmar and Mahrt-Smith (2007), however, an endogeneity problem occurs if the raw market-to-book ratio is used to predict the 'normal' level of cash in order to calculate excess cash, and excess cash is then taken to predict the market-to-book ratio. Therefore, Dittmar and Mahrt-Smith (2007) instrument the market-to-book ratio with past sales growth ($SALESg$) and then use this instrumented market-to-book ratio to predict cash holdings. We endorse their approach and instrument the market-to-book ratio by the average of last year's and the current year's sales growth. To fully adhere to Opler et al. (1999), we also include capital expenditures, leverage, and a dividend dummy. The regression model to estimate the optimal level of cash is:[16]

$$\begin{aligned}\ln\left(\frac{C_t}{NA_t}\right) &= \alpha + \beta_1 \ln(realNA_t) + \beta_2\frac{FCF_t}{NA_t} + \beta_3\frac{NWC_t}{NA_t} + \beta_4(Vola12)_t \\ &+ \beta_5\frac{\hat{MV}_t}{TA_t} + \beta_6\frac{RD_t}{Sales_t} + \beta_7\frac{Capex_t}{NA_t} + \beta_8\frac{Debt_t}{TA_t} \\ &+ \beta_9 DIVDUM_t + SECTDUM + \varepsilon_t\end{aligned} \tag{6}$$

with:

[16] Opler et al. (1999) also include a regulation dummy, whereas we include sector dummies. Furthermore, we cannot use an industry sigma as our volatility measure due to multicollinearity and use the standard deviation of the firm's stock price instead. Our results remain qualitatively the same when we calculate the volatility of cash flows averaged over the sectors and omit the sector dummies in the predictive regression.

C_t:	Cash
NA_t:	Net assets (book value of total assets minus cash)
$realNA_t$:	Natural logarithm of net assets in dollar terms for the year 2000
FCF_t:	Operating income after interest and taxes
NWC_t:	Working capital minus cash
$Vola12_t$:	Standard deviation of a firm's monthly stock return over the prior 12 months
$\hat{MV}_t$:	Market value of the firm, computed as the number of shares outstanding times price plus total liabilities (instrumented with the average of last year's and current year's sales growth ($SALESg$))
RD_t:	R&D expenditures
$Capex_t$:	Capital expenditures
$Debt_t$:	Total debt (interest bearing)
$DIVDUM_t$:	Dividend dummy, which is set equal to one if the firm paid dividends or engaged in share repurchases and zero in all the other cases
$SECTDUM$:	Sector dummies

The predictive regression is estimated using the Fama-MacBeth approach. Excess cash, denoted as *ExCash*, is calculated then as the difference between the actual cash ratio and the exponential of the predicted log cash ratio. The descriptive statistics of the necessary data are presented in Panel B of Table 2. The values are broadly in line with those reported in Dittmar and Mahrt-Smith (2007).

Having determined excess cash in a first step, Dittmar and Mahrt-Smith (2007) continue by calculating the effects of this variable on the value of the firm in a second step. Excess cash filters out the components of the actual cash ratio that cannot be directly related to operational needs or investment opportunities. It is presumably held for discretionary reasons and is especially prone to managerial squandering, i.e., it can more easily be siphoned off when compared to plant or equipment. Therefore, excess cash is directly related to Jensen's (1986) free cash flow hypothesis. In order to test the market value of excess cash in connection with firm-specific and time-varying IA, we use an extended version of the Fama and French (1998) valuation model:

$$
\begin{aligned}
V_{i,t} = \alpha &+ \beta_1 E_{i,t} + \beta_2 dE_{i,t} + \beta_3 dE_{i,t+1} + \beta_4 dNA_{i,t} + \beta_5 dNA_{i,t+1} \\
&+ \beta_6 RD_{i,t} + \beta_7 dRD_{i,t} + \beta_8 dRD_{i,t+1} + \beta_9 I_{i,t} + \beta_{10} dI_{i,t} + \beta_{11} dI_{i,t+1} \\
&+ \beta_{12} D_{i,t} + \beta_{13} dD_{i,t} + \beta_{14} dD_{i,t+1} + \beta_{15} dV_{i,t+1} + \beta_{16} ExCash_{i,t} \\
&+ \beta_{17} (ExCash \times dispM)_{i,t} + \beta_{18} dispM_{i,t} + \alpha_i + \mu_t + \varepsilon_{i,t}
\end{aligned}
\tag{7}
$$

Following Dittmar and Mahrt-Smith (2007), all variables are scaled by net assets, and the valuation regression is estimated using a fixed effects model for positive values of excess cash. We hypothesize that

IA affects the impact of excess cash on firm value. We test this notion by interacting the dispersion of analysts' forecasts with excess cash to determine the incremental impact on firm value. Therefore, the main coefficient of interest is β_{17}. Again, a positive coefficient supports our hypothesis 1 (related to the pecking order theory), a negative one supports our hypothesis 2 (related to the free-cash flow theory). The model is again estimated using fixed effects and Driscoll and Kraay (1998) standard errors.

4 Empirical Tests of the Hypotheses

4.1 Results from the Approach by Pinkowitz, Stulz, and Williamson (2006)

We start with the results from the approach suggested by Pinkowitz and Williamson (2004) and Pinkowitz et al. (2006). Table 3 presents the results of the model without IA. They provide the basis for a comparison of the estimated coefficients with those in previous studies that do not incorporate the influence of IA. Most of the coefficients have the expected signs, and many are similar in magnitude to those in Pinkowitz and Williamson (2004). Nevertheless, there are several differences. For example, they present a positive coefficient on the earnings variable (E_t) in the Fama-MacBeth model compared to a negative one in the fixed effects specification. In contrast, we report positive coefficients in both specifications. An explanation is that the Fama-MacBeth approach cannot control for firm fixed effects. Another observation is that the estimated coefficient on earnings changes (dE_t) is negative in the fixed effects model and positive when the Fama-MacBeth approach is used. However, only the positive coefficient is statistically significant.

The most important coefficients are those on cash (C) and on changes in cash (dC_t). We focus on the fixed effects model that includes the level of cash as an explanatory variable. Using the entire sample, the estimated coefficient on cash is 0.696. It is strongly significant and can be interpreted as the market value of a dollar of cash. The comparable coefficient in Pinkowitz and Williamson (2004) is 1.05, but they only use a U.S. sample. Therefore, our results should rather be compared with those in Pinkowitz et al. (2006), who use an international sample. They do not report the corresponding coefficient for their whole sample but only for subgroups of countries. In addition, they only use the Fama-MacBeth approach. Depending on the subgroups (e.g., high versus low corruption countries), they report coefficients that range between 0.03 and 1.24. Our estimated coefficient lies within this range and should be considered as economically plausible. Inspecting the results from alternative estimation methods in Table 3, however, it becomes apparent that the coefficients on C and dC_t vary considerably. The only consistent result is that the coefficients on cash and those on cash changes are higher in the U.S. subsample compared to the non-U.S. subsample in every model. Nevertheless, we do not argue to estimate the effective market value of cash holdings. Instead, our goal is to assess whether the impact of firm-specific and time-varying IA on the market value of a dollar of cash is positive or negative.[17]

Table 4 presents the results of the models that include the dispersion of analysts' earnings forecasts (*dispM*), which is our measure for firm-specific and time-varying IA, and its interaction term with cash.[18] Most important, we report a significantly negative coefficient on the interaction variable. We interpret this result as support for our hypothesis 2, suggesting that cash holdings have less value for a firm in periods with a high degree of IA. Therefore, the free cash flow problem seems to be more relevant in connection with IA than the advantage of having a liquidity reserve when the (adverse selection) costs of raising external funds are prohibitive. To check whether this negative effect of IA on liquidity is also economically significant, we calculate—recognizing the limitations of this exercise—the marginal value of cash conditional on the level of IA. Including an interaction term into the analysis, the market value of an additional dollar of cash is as follows:

$$\frac{V}{A} = \alpha + ... + \beta_c \frac{C}{A} + \beta_{INT} \left(\frac{C}{A} \times dispM \right) + \beta_{dispM} dispM \tag{8}$$

$$\frac{\partial \frac{V}{A}}{\partial \frac{C}{A}} = \frac{\partial V}{\partial C} = \beta_c + \beta_{INT} dispM \tag{9}$$

Looking at the results of the fixed effects model, the estimated coefficient on cash is 0.782, and that on the interaction term is -0.594. Based on the median value of *dispM* (0.109, see Table 2), the marginal value of an additional dollar of cash is 0.717 ($= 0.782 - 0.594 \times 0.109$). An increase in the degree of IA by one standard deviation (0.249, see Table 2) results in a marginal value of cash that is 0.148 dollar lower, hence, the market value of an additional dollar of cash decreases to 0.569. Therefore, the negative effect of IA on the value of cash is also economically significant. To control for the direct influence of the dispersion of analysts' earnings forecasts on firm value, we include the variable *dispM*. The results suggest that this relationship is ambiguous. On the one hand, a negative relation can be explained by the notion that IA is generally unfavorable from an investor's perspective. On the other hand, a positive relation may be related to Miller (1977), who argues that a higher divergence of opinions among investors tends to increase the market value of securities as only the most optimistic investors engage in trading.[19]

[17] The limitations of the standard interpretations become particularly apparent when the scaling of the variables is changed (e.g., using net assets instead of total assets). In results not reported here, we find qualitatively similar results, although the coefficients on C and on dC_t change considerably in some specifications.

[18] The observations for which *dispM* is not defined drop out from the sample. The numbers of groups remain the same in all specifications, because we exclude all firms for which *dispM* is not defined in at least one year in a first step.

[19] Diether et al. (2002) provide empirical evidence for this model.

In Table 5, we present more detailed results from splitting our sample according to firm characteristics. First, we differentiate by firm size (based on the market capitalization) and by the payout ratio (including dividends and share repurchases) to test the impact of financial constraints. Second, the sample is split by the proportion of insider ownership (closely held shares) to test the influence of the quality of corporate governance. Based on the fixed effects model, we conclude that cash tends to have a higher market value for small firms than for large firms. This finding is consistent with the notion that large firms are less constrained and can more easily access financial markets in order to raise external funds. However, this result is not robust if the Fama-MacBeth approach is used. The results for the interaction term are more robust and suggest that the negative effect of IA on the market value of cash is tend to be weaker for small firms. Presumably, both effects of the two conflicting hypotheses are at work. The overall negative effect of IA on the market value of an additional dollar of cash (as predicted by our hypothesis 2) is to some extent canceled out by an opposing effect, implying that cash is relatively more valuable in periods with pronounced IA due to higher adverse selection costs (as predicted by our hypothesis 1). When the payout ratio is used as a proxy for the degree of financial constraints, we again find that cash is more valuable for firms that face financial constraints (low payout subgroup). However, the results involving the interaction term are mixed.

A final split of our sample on the firm-level by the percentage of closely held shares produces three subgroups. Specifically, we follow Morck et al. (1988) and choose three cut-off levels for insider ownership: 0–5%, 5–25%, and 25% or more.[20] Based on previous findings, one would expect that cash has less value and that IA has a more negative impact on firm value when insider ownership falls into the range between 5% and 25% due to an entrenchment effect that dominates an incentive-alignment effect. Firms in this medium range of insider ownership presumably suffer more from moral hazard problems, because managers could fleece their minority shareholders more easily. In contrast to this prediction, we report for most models that cash has a higher market value in this subsample. These findings indicate that the incentive effect dominates the entrenchment effect in the middle range of ownership concentration. They are consistent with the results of McConnell and Servaes (1990), who document a positive relationship between firm value and insider ownership up to a fraction of about 45%. The relationship between the coefficient on the interaction term and the proportion of closely held shares is not clear-cut. If anything, there is a tendency that the negative influence of IA on the marginal value of cash is more pronounced for firms with low insider shareholdings.

In Table 6, we report the results when our sample is splitted using measures for the quality of corporate governance and financial constraints at the country-level. The first three models are based on the rule of

[20] Opler et al. (1999) use the same cut-off levels.

law index, the anti-director-rights index, and the corruption index. For each index, the sample is divided into two groups according to a higher or lower index value than the median country. A higher index value indicates that a country applies better corporate governance practices. In most instances, our results confirm the expectations. In line with Jensen's (1986) free cash flow hypothesis, the coefficient on cash tends to be higher for firms located in countries with a higher index value, and the negative influence of IA on the market value of cash tends to be stronger for firms in countries with a lower index value. These results support the notion of our hypothesis 2 that the problems associated with IA are more pronounced for firms that operate in countries with lower corporate governance standards.

The final two sample splits are based on financing practices at the country-level. We use both the ratio of stock and private bond market capitalization divided by the gross domestic product as measures of financial constraints. Presumably, in countries with lower ratios, internal finance is even more important than in other countries and cash holdings are essential. A less negative coefficient on the interaction term or even a positive relationship between cash holdings and IA for firms in constrained countries would support our hypothesis 1 (suggesting that cash has a higher market value when IA is more pronounced). However, we find exactly the opposite result, i.e., both coefficients on cash and on the interaction term are generally smaller for firms in countries with lower ratios. There are two potential explanations for this result. A first explanation is based on the correlation of a country's financing and corporate governance practices. Common law countries are typically market-based countries, and one expects that these countries also have a higher ratio of bond and stock capitalization to gross domestic product than civil law countries. La Porta et al. (2000) report that minority shareholders are generally better protected in common law countries. A second explanation for our results is based on role of financial intermediaries and their impact on IA. Civil law countries tend to be bank-based, and financial intermediaries play a major role. Leland and Pyle (1977) suggest that financial intermediaries should be considered as a natural response to IA. In contrast to shareholders and bondholders, banks know more about a company's prospects than the average investor, because they have privileged access to information. Presumably, the adverse selection problem is less important for banks than for other investors. In market-based countries, where firms typically access financial markets to raise funds, IA is more pronounced than in bank-based countries. Therefore, our hypothesis 1 may be more important for firms in common law countries.

4.2 Results from the Approach by Dittmar and Mahrt-Smith (2007)

The alternative approach to estimate the market value of cash holdings by Dittmar and Mahrt-Smith (2007) includes a measure of excess cash into the model. In Table 7, we report the results from estimating a variant of the Fama and French (1998) valuation regression including firms that experience a positive value of excess cash. The results are again estimated using fixed effects, and using the Fama-MacBeth approach as a robustness test. The estimated coefficient on excess cash (*ExCash*) is both statistically and economically significant. Looking at the fixed effects model, the estimated coefficient is 1.905, implying that one dollar put into excess cash increases firm value by more than its par value. This finding is comparable to that in Dittmar and Mahrt-Smith (2007), who report that a dollar of excess cash increases firm value by two to three dollars, depending on the corporate governance measure they use. However, they avoid to interpret the coefficient on excess cash because of concerns about endogeneity between cash and firm value. The market-to-book ratio, as a proxy for investment opportunities, determines total cash holdings. But cash holdings also affect the market value of the firm and, hence, the market-to-book ratio. Although they use an instrumented market-to-book ratio to compute the normal cash level (implying that excess cash is orthogonal to the market-to-book ratio by construction), they only focus on the interpretation of the interaction term, i.e., excess cash times the corporate governance index.

In order to investigate the value consequences of cash in connection with IA, Table 7 also includes the dispersion of analysts' earnings forecasts (*dispM*) as our measure for firm-specific and time-varying IA as well as an interaction term that captures the combined effect of excess cash and IA. Our results reveal that the coefficient on the interaction term is negative and significant in all but one specification. This finding suggests that increasing IA decreases the marginal benefit of holding excess cash and again corroborates our hypothesis 2. In order to illustrate the detrimental value effect of IA, we calculate the market value of an additional dollar of excess cash in connection with IA for the fixed effects model. The coefficient on excess cash in Table 7 is 1.905. If IA is taken into account, the marginal value of excess cash reduces to 1.863 (based on the median value of *dispM* of 0.088 in Panel B of Table 2).[21] Increasing IA by one standard deviation (0.241 in Panel B of Table 2), the market value of one additional dollar of excess cash decreases by 0.115 (6.2%) dollar to 1.747.[22] Overall, we conclude the market value of excess cash is statistically and economically significantly lower when IA is more pronounced. As stated in our hypothesis 2, immediate one explanation is that the agency costs according to the free cash flow theory dominate the potential savings from the availability of internal capital when the degree of IA is higher.

In a final step, we again split the sample into subgroups based on the quality of corporate governance (related to the free cash flow theory) and financing constraints (related to adverse selection problems).[23] The results are reported in Table 8. The first corporate governance grouping on the country-level is based

[21] The calculation is as follows: $1.863 = 1.905 + (-0.479) \times 0.088$. See section 4.1 for more details on the calculation of the marginal value of cash.

[22] The calculation is as follows: $1.747 = 1.905 + (-0.479) \times (0.088 + 0.241)$.

[23] We abstain from grouping firms along the dimensions size and payout ratio, because these two characteristics are endogenously related to the computation of excess cash. We also omit the insider ownership split. The corresponding results were insignificant for the actual cash ratio in section 4.1.

on the rule of law index. Supporting our hypothesis 2, the estimated interaction term is more negative in low rule of law countries. A higher degree of IA significantly decreases the market value of an additional dollar of excess cash, and this effect is even more pronounced when the corporate governance environment is weak. A split of the sample according to the anti-director-rights index further supports this notion. In line with Jensen's (1986) free cash flow theory, the market value of excess cash significantly decreases with increasing IA if the protection of minority shareholders is weak. The evidence for the corruption index points into the same direction. The interaction term for high corruption countries (with a low corruption index) is negative and higher in absolute terms than for low corruption countries. The final split at the country-level is into common law countries and civil law countries. The coefficient on the level of excess cash is lower in civil law countries than in common law countries. This confirms the results by La Porta et al. (1998), indicating that the corporate governance environment in countries with a civil law tradition is weaker. Moreover, the coefficient on the interaction term is significantly negative in civil law countries and insignificant in common law countries. Taken together, the sample splits according to our corporate governance measures indicate that a higher degree of IA decreases the market value of excess cash, and that this effect is even more pronounced if the quality of corporate governance is low. This finding supports the free cash flow theory of Jensen (1986).

Table 8 also contains the result from sample splits according to financial constraints at the country-level. We expect that in countries where the capital market is less developed, e.g., lower stock market capitalization to gross domestic product, hoarding cash becomes more important as external finance is harder to obtain. Therefore, in countries where the capital market development is lower, the coefficient on excess cash is higher and the interaction term with IA presumably less negative. However, this prediction is not borne out by our data. For both measures of the capital market development, the estimated coefficient on excess cash is lower for more constrained countries, and the interaction term is significantly negative only in constrained countries. Again, one potential explanation for these findings is that our measure for capital market development is imperfect, because there is a high correlation between a country's law tradition (i.e., civil law versus common law) and our measure for the capital market development.

Overall, our results again reveal that a higher degree of IA decreases the market value of an additional dollar of cash. This finding is in line with Jensen's (1986) free cash flow argument and supports our hypothesis 2. It contradicts Myers and Majluf's (1984) notion about the value enhancing role of financial slack, in particular, in states when IA is highly pronounced. Therefore, our hypothesis 1 is not supported by the data.

4.3 Robustness Tests

To further test the robustness of our results, we change the specification of our main model as well as the definition of several variables. The coefficients of interest are presented in Table 9. For the sake of brevity, we only report (with one exception) the results of the fixed effects estimation including the level of cash. For the ease of comparison, Panel A of Table 9 presents the coefficients on cash and on the interaction variable as they were presented in the first column of Table 4.

- *Panel B:* Our valuation regressions are based on Fama and French (1998). While they use two-year changes for the explanatory variables in differences in order to model investors' expectations, we follow Pinkowitz et al. (2006) and Dittmar and Mahrt-Smith (2007) and only use one-year changes. Using two-year changes instead, our sample becomes smaller, but we still document a negative influence of IA on the market value of cash holdings.

- *Panel C:* When we estimate the valuation regressions omitting time dummies, the coefficients and their statistical inference do not change qualitatively.

- *Panel D:* Rather than using fixed effects, we estimate the model using ordinary least squares with cluster robust standard errors (Arellano, 1987; Rogers, 1993). While the coefficient on the level of cash changes considerably, that on the interaction variable is more stable and remains significant (albeit not at the 1% level).

- *Panel E:* In order to control for a possible correlation between risk (in a broader sense) and IA, we include two additional variables. First, we add the standard deviation of monthly stock returns over the accounting year as a direct measure for risk. Second, we include the interaction term between the cash and stock return volatility. As before, we report a significantly negative coefficient on the interaction term between cash and IA. In contrast, the estimated coefficient on the interaction term between cash and risk is positive (and significant for non-U.S. firms). This finding can be explained by the notion that cash is more valuable when a firm's business risk is higher. The influences of risk and IA run into opposite directions. Therefore, we conclude that our results cannot be explained by a positive correlation between our measure for IA and risk.

- *Panel F:* In a final robustness test, we change our proxy for IA. Instead of using the dispersion of analysts' earnings forecasts, we measure IA based on analysts' forecast errors (see the discussion in section 3.1.1). This variable is calculated as follows:

$$ForecastError = \ln\left(1 + \frac{|EPS_{forecast} - EPS_{actual}|}{|Median|}\right) \tag{10}$$

where the forecast of the earnings per share (EPS) is the average of all forecasts provided by the analysts in November and December. The difference between the actual and the forecasted earnings per share in absolute terms is scaled by the median of the earnings per share forecast. Similar to the calculation of *dispM*, we add one to this ratio and take the natural logarithm. Observations are excluded if the average of the forecasts is not at least based on the estimates of two analysts. The results in Panel F indicate that our main findings are robust to a change of the measure for IA.

5 Conclusions

This study examines the value effects of corporate cash holdings. The previous literature on cash holdings explores the valuation effects by differentiating firms along their quality of corporate governance. We take a different perspective and focus on the valuation effects of cash in connection with firm-specific and time-varying information asymmetry (IA). Specifically, we present two opposing hypotheses. First, focusing on Myers and Majluf (1984), cash holdings in combination with a higher degree of IA should have a positive influence on the value of a firm, because the adverse selection costs from external finance can be avoided. Second, based on Jensen (1986), the free cash flow theory coupled with more pronounced IA leads to moral hazard. Accordingly, the market value of cash should be lower.

To sort out these two opposing hypotheses, we examine a large data set covering 7,474 firms from 45 countries. We use the Fama and French (1998) valuation regressions and derive our results from two different cash models. As suggested by Pinkowitz et al. (2006), we employ the actual cash ratio in our main model. In a robustness test, we also calculate the excess cash based on Opler et al. (1999) and Dittmar and Mahrt-Smith (2007). In both specifications, we use the dispersion of analysts' earnings forecasts as our measure for firm-specific and time-varying IA.

When the actual cash ratio is used, our results indicate that the market value of one dollar without taking information asymmetry into account is around 1.0, on average. This result is consistent with previous findings by Pinkowitz and Williamson (2004) and Pinkowitz et al. (2006). However, the market value of cash is significantly reduced when the firm faces a high level of IA. This evidence suggests that the agency costs of the free cash flow outweigh the benefits from cash as an internal source of finance. To further distinguish between our two opposing hypotheses, we split the sample according to the quality of corporate governance and financial constraints. Taken together, these sample splits reinforce our finding that agency costs due to moral hazard decrease the market value of an additional dollar of cash. Specifically, the market value of cash is higher if the quality of corporate governance is better. The hypothesis that cash is valued higher if a firm is financially constrained is only partly confirmed by our data.

The second approach uses excess cash instead of the cash level as an explanatory variable. The results from this two-step approach stay qualitatively the same. In the basic model, they are similar to Dittmar and Mahrt-Smith (2007) and, hence, we interpret them as an important robustness check. Extending their model, we report that a higher degree of information asymmetry significantly decreases the market value of excess cash. This evidence further supports Jensen's (1986) free cash flow theory. Based on different subsamples, the value of excess cash is again higher if the quality of corporate governance is better. However, no clear-cut picture emerges from differentiating the sample according to financial constraints.

In summary, our results indicate that the agency costs based on the free cash flow theory outweigh the benefits from financial slack in mitigating adverse selection costs when raising external funds. Put differently, our findings indicate that it is not in the shareholders' interest that firms hoard liquidity due to problems induced by IA. That is why the precautionary motive to hold cash appears to be questionable. However, our findings do not contradict the pecking order theory in general. We do not suggest that firms should not use internal funds in the first place before external funds are raised. Instead, we rather argue that it is not optimal for firms to accumulate cash with the intention to avoid (costly) external finance in future states when IA is high.

Appendix

The detailed formula for our main measure for information asymmetry ($dispM_{i,t}$) is:

$$dispM_{i,t} = \ln\left(1 + \frac{1}{M_{i,t}} \times \sqrt{\sum_{m_{i,t}=1}^{M_{i,t}} \left(\frac{\frac{1}{A_{m_{i,t}}-1} \times \sum_{a_{m_{i,t}}=1}^{A_{m_{i,t}}} (EPS_{a_{m_{i,t}}} - \frac{1}{A_{m_{i,t}}} \times \sum_{a_{m_{i,t}}=1}^{A_{m_{i,t}}} EPS_{a_{m_{i,t}}})^2}{Med_{m_{i,t}}} \right)}\right)$$

with:

$Med_{m_{i,t}}$: Absolute median earning per share forecast in month m in year t for firm i

$A_{m_{i,t}}$: Number of analysts that cover firm i in year t in month m

$M_{i,t}$: Number of months for which more than three analysts cover firm i in year t

$EPS_{a_{m_{i,t}}}$: Earnings per share estimate of analyst a for firm i in year t in month m

Table 1: Observations per country and index values

Country	N Method 1	N Method 2	Corrupt. index	Rule of law index	Anti-dir. right index	Stock-gdp ratio	Bond-gdp ratio	Com. law	Civil law
Argentina	151	141	-0.40	0.07	4	0.44	0.05	0	1
Belgium	428	370	1.32	1.53	0	0.81	0.46	0	1
Brazil	515	356	-0.01	-0.21	3	0.38	0.09	0	1
Canada	1551	1023	2.25	1.87	5	1.16	0.22	1	0
Chile	395	78	1.50	1.23	5	0.86	0.17	0	1
China	816	0	-0.38	-0.42	.	0.42	0.09	0	1
Colombia	42	0	-0.51	-0.73	3	0.13	0.00	0	1
Czech Republic	51	0	0.39	0.51	.	0.21	0.07	0	1
Denmark	452	69	2.31	1.87	2	0.68	1.03	0	1
Finland	671	608	2.49	2.02	3	2.70	0.24	0	1
France	2090	1842	1.41	1.36	3	1.13	0.40	0	1
Germany	2005	1727	1.67	1.84	1	0.73	0.62	0	1
Greece	694	168	0.84	0.66	2	1.42	0.00	0	1
Hong Kong	941	64	1.43	1.44	5	3.76	0.18	1	0
Hungary	101	0	0.71	0.77	.	0.31	0.02	0	1
India	121	0	-0.31	0.15	5	0.37	0.00	1	0
Indonesia	572	0	-1.05	-1.03	2	0.28	0.01	0	1
Ireland	217	208	1.50	1.71	4	0.80	0.08	1	0
Israel	153	83	1.11	0.96	3	0.56	.	1	0
Italy	891	786	0.79	0.88	1	0.70	0.33	0	1
Japan	846	0	1.28	1.66	4	0.82	0.47	0	1
Korea, South	2100	0	0.33	0.52	2	0.56	0.40	0	1
Malaysia	891	312	0.21	0.39	4	1.46	0.49	1	0
Mexico	628	177	-0.49	-0.45	1	0.24	0.02	0	1
Netherlands	1036	919	2.30	1.89	2	1.81	0.47	0	1
Norway	580	73	2.07	1.90	4	0.39	0.20	0	1
Pakistan	40	0	-0.94	-0.75	5	0.09	.	1	0
Peru	104	77	-0.16	-0.60	3	0.23	0.04	0	1
Philippines	268	0	-0.53	-0.55	3	0.66	0.00	0	1
Poland	217	63	0.48	0.54	.	0.18	.	0	1
Portugal	227	211	1.37	1.07	3	0.60	0.25	0	1
Russia	54	0	-1.04	-0.99	.	0.22	.	0	1
Singapore	750	578	2.44	1.91	4	1.93	0.18	1	0
South Africa	168	51	0.49	0.15	5	1.77	0.09	1	0
Spain	619	542	1.62	1.29	4	0.84	0.15	0	1
Sweden	964	93	2.43	1.87	3	1.47	0.43	0	1
Switzerland	871	796	2.17	2.11	2	3.03	0.43	0	1
Taiwan	2057	0	0.63	0.76	3	1.02	0.26	0	1
Thailand	888	0	-0.37	0.30	2	0.36	0.12	1	0
Turkey	265	227	-0.36	-0.07	2	0.46	.	0	1

(continued)

Table 1: —*continued*

country	N Method 1	N Method 2	Corrupt. index	Rule of law index	Anti-dir. right index	Stock-gdp ratio	Bond-gdp ratio	Com. law	Civil law
United Kingdom	2571	2316	2.10	1.80	5	1.93	0.20	1	0
United States	13102	11270	1.73	1.79	5	1.64	1.02	1	0

This table shows the number of observations (N meth.1, N meth. 2) for the countries that are included in the two regression specifications. It also presents the values of the indices that are used to split the sample into subgroups by country characteristics. The definitions of the indices are provided in section 3.1.3. A dot indicates that for a particular country the index value is not defined.

Table 2: Descriptive statistics

	Panel A					
Variable	N	p10	Mean	p50	p90	S.D.
V	42,746	0.515	1.280	0.962	2.370	1.030
dV(t+1)	42,746	-0.399	0.163	0.045	0.806	0.892
RD	42,746	0.000	0.016	0.000	0.053	0.041
dRD(t)	42,746	-0.001	0.001	0.000	0.005	0.012
dRD(t+1)	42,746	-0.001	0.001	0.000	0.006	0.012
E	42,746	-0.035	0.056	0.062	0.155	0.101
dE(t)	42,746	-0.051	0.007	0.008	0.064	0.064
dE(t+1)	42,746	-0.053	0.010	0.008	0.075	0.069
dNA(t)	42,746	-0.115	0.064	0.054	0.283	0.184
dNA(t+1)	42,746	-0.120	0.095	0.047	0.344	0.255
D	42,746	0.000	0.018	0.009	0.049	0.027
dD(t)	42,746	-0.010	0.002	0.000	0.016	0.020
dD(t+1)	42,746	-0.011	0.003	0.000	0.020	0.023
I	42,746	0.002	0.020	0.016	0.043	0.019
dI(t)	42,746	-0.008	0.001	0.000	0.010	0.010
dI(t+1)	42,746	-0.008	0.001	0.000	0.011	0.011
C	42,746	0.009	0.125	0.073	0.310	0.147
dC(t)	42,519	-0.063	0.006	0.002	0.082	0.080
dC(t+1)	42,587	-0.063	0.012	0.002	0.090	0.093
dispM	29,963	0.023	0.193	0.109	0.458	0.249
V2	25,777	0.937	2.050	1.470	3.630	1.910
dV2(t+1)	25,777	-0.498	0.275	0.083	1.170	1.570
RD	25,777	0.000	0.031	0.000	0.091	0.089
dRD(t)	25,777	-0.001	0.002	0.000	0.009	0.023
dRD(t+1)	25,777	-0.001	0.003	0.000	0.009	0.024
E	25,777	-0.042	0.065	0.076	0.189	0.155
dE(t)	25,777	-0.059	0.010	0.010	0.080	0.102
dE(t+1)	25,777	-0.059	0.014	0.010	0.094	0.102
dNA(t)	25,777	-0.143	0.066	0.058	0.327	0.231
dNA(t+1)	25,777	-0.144	0.117	0.050	0.414	0.345
D	25,777	0.000	0.024	0.011	0.062	0.037

(continued)

Table 2: —*continued*

	Panel B					
Variable	N	p10	Mean	p50	p90	S.D.
dD(t)	25,777	-0.013	0.003	0.000	0.020	0.028
dD(t+1)	25,777	-0.014	0.004	0.000	0.024	0.033
I	25,777	0.003	0.021	0.018	0.042	0.019
dI(t)	25,777	-0.008	0.001	0.000	0.010	0.011
dI(t+1)	25,777	-0.008	0.001	0.000	0.011	0.013
C	25,777	0.009	0.177	0.069	0.417	0.345
dC(t)	25,742	-0.071	0.009	0.002	0.098	0.135
dC(t+1)	25,754	-0.071	0.014	0.003	0.109	0.152
dispM	20,089	0.019	0.173	0.088	0.426	0.241
errorF12	19,229	0.000	0.331	0.065	1.020	0.927
lnCash	25,777	-4.700	-2.730	-2.670	-0.875	1.490
RealNA	25,777	10.900	13.200	13.000	15.600	1.750
FCF	25,777	-0.070	0.019	0.035	0.119	0.142
NWC	25,777	-0.154	0.059	0.054	0.298	0.191
Vola12	25,777	0.054	0.124	0.105	0.219	0.072
RD/sales	25,777	0.000	0.031	0.000	0.083	0.115
MV	25,777	0.871	1.660	1.330	2.830	1.080
SALESg	25,777	-7.240	17.000	9.400	46.500	33.800
Leverage	25,777	0.016	0.250	0.239	0.476	0.177
DIVDUM	25,777	0.000	0.714	1.000	1.000	0.452
Capex	25,777	0.017	0.075	0.055	0.155	0.068

The table shows summary statistics (number of observations, 10% and 90% percentile, mean, median, and the standard deviation) of the scaled variables over the 1995 to 2005 period included in our two regression specifications. The variables in Panel A are required for the regression approach by Pinkowitz et al. (2006), those in Panel B for the regression approach by Dittmar and Mahrt-Smith (2007). The definitions of these variables are provided in section 3.2.2.

Table 3: Estimated value of cash

	All firms				Non-U.S. firms			
	FixEf.		FMBeth		FixEf.		FMBeth	
	level	diff.	level	diff.	level	diff.	level	diff.
E	2.884***	2.678***	1.785***	1.325***	2.277***	2.204***	1.958***	1.919***
	(27.54)	(15.88)	9.7	(7.92)	(12.10)	(10.11)	(7.13)	(6.63)
dE(t)	-0.082	-0.157***	0.802***	0.808***	-0.220**	-0.269**	0.023	-0.027
	(-1.19)	(-2.93)	(4.12)	(4.02)	(-2.09)	(-2.20)	(0.10)	(-0.12)
dE(t+1)	1.729***	1.499***	1.793***	1.444***	1.118***	1.007***	1.058***	0.971***
	(27.26)	(25.55)	(11.77)	(12.14)	(8.32)	(9.78)	(5.50)	(7.21)
dNA(t)	0.322***	0.302***	0.760***	0.661***	0.255***	0.232***	0.542***	0.452***
	(12.88)	(15.40)	(8.32)	(7.93)	(14.30)	(12.16)	(6.53)	(5.65)
dNA(t+1)	0.588***	0.647***	0.455***	0.544***	0.588***	0.612***	0.469***	0.509***
	(8.42)	(10.06)	(4.42)	(4.93)	(8.52)	(8.92)	(3.90)	(4.05)
RD	4.011***	3.645***	5.672***	7.392***	1.654**	1.659**	6.107***	6.904***
	(18.38)	(12.37)	(13.22)	(14.26)	(2.47)	(2.14)	(9.79)	(10.05)
dRD(t)	1.689***	1.561***	2.585**	2.584**	1.836***	1.578***	2.173	1.981
	(4.83)	(5.17)	(2.68)	(2.34)	(3.85)	(3.19)	(1.76)	(1.60)
dRD(t+1)	6.326***	5.385***	8.643***	9.266***	3.593***	3.369***	7.526***	8.090***
	(10.96)	(15.41)	(8.90)	(10.33)	(12.19)	(11.62)	(8.39)	(9.32)
I	-0.342	-0.848***	0.967	-1.952**	-1.294***	-1.714***	-0.074	-1.555**
	(-1.47)	(-3.28)	(1.39)	(-2.50)	(-3.59)	(-4.66)	(-0.10)	(-2.40)
dI(t)	-1.169***	-1.161***	-0.516	0.090	-0.022	0.058	0.607	1.239**
	(-3.07)	(-3.64)	(-0.49)	(0.13)	(-0.05)	(0.14)	(0.91)	(2.29)
dI(t+1)	-2.861***	-3.577***	-2.739**	-4.334***	-2.073***	-2.623***	-1.525*	-2.416***
	(-9.87)	(-13.88)	(-2.93)	(-4.72)	(-7.41)	(-10.20)	(-2.16)	(-3.85)
D	1.162***	2.032***	7.150***	7.873***	2.229***	2.830***	7.571***	8.156***
	(3.06)	(5.97)	(25.61)	(28.50)	(4.15)	(5.48)	(12.31)	(14.71)

(continued)

Table 3: —*continued*

	All firms				Non-U.S. firms			
	FixEf.		FMBeth		FixEf.		FMBeth	
	level	diff.	level	diff.	level	diff.	level	diff.
dD(t)	-0.392**	-0.426**	-2.350***	-1.887***	-0.484**	-0.496***	-1.930***	-1.733***
	(-2.19)	(-2.52)	(-5.32)	(-4.16)	(-2.46)	(-2.59)	(-3.93)	(-3.55)
dD(t+1)	0.623***	0.970***	2.754***	3.507***	0.868***	1.124***	2.846***	3.305***
	(4.51)	(8.62)	(8.65)	(10.00)	(4.63)	(6.88)	(6.54)	(7.47)
dV(t+1)	-0.247***	-0.288***	-0.127	-0.172	-0.263***	-0.289***	-0.170	-0.202
	(-5.67)	(-6.04)	(-1.33)	(-1.63)	(-4.65)	(-4.89)	(-1.37)	(-1.58)
C	**0.696*** **		**1.868*** **		**0.466*** **		**1.104*** **	
	(5.99)		(10.36)		(6.30)		(7.94)	
dC(t)		**0.809*** **		**1.324*** **		**0.552*** **		**0.780*** **
		(17.31)		(5.62)		(9.80)		(3.89)
dC(t+1)		0.997***		1.146***		0.785***		0.830***
		(7.91)		(4.62)		(7.98)		(3.84)
Const.	0.812***	1.021***	0.552***	0.792***	0.787***	0.960***	0.571***	0.695***
	(30.94)	(82.11)	(39.85)	(28.58)	(27.88)	(55.88)	(41.52)	(41.01)
R^2	0.289	0.321	0.397	0.375	0.272	0.291	0.375	0.374
N	42746	42392	42746	42392	29644	29515	29644	29515
Groups	7474	7433	10	10	4991	4981	10	10

This table shows the estimation results without IA for fixed effects regressions (FixEf.) and Fama-MacBeth regressions (FMBeth) for the cross-country sample over the 1995 to 2005 period. The dependent variable in all specifications is the total market value scaled by total assets. The definitions of all variables are provided in section 3.1.2. Year dummies are included in all specifications, but are not presented to save space. Statistical inference is based on Driscoll and Kraay (1998). *t*-values are presented in parentheses. The R^2 of the fixed effects regression represents the R^2 of the within-dimension. The R^2 of the Fama-MacBeth regression is the average value of the R^2 of the single years. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 4: Estimated value of cash in connection with IA

	All firms				Non-U.S. firms			
	FixEf.		FMBeth		FixEf.		FMBeth	
	level	diff.	level	diff.	level	diff.	level	diff.
E	4.305***	3.983***	2.448***	1.872***	4.299***	4.206***	3.032***	3.106***
	(18.94)	(12.97)	(12.31)	(7.90)	(10.18)	(10.20)	(6.61)	(6.99)
dE(t)	-0.368***	-0.396***	0.789**	0.804**	-0.736***	-0.824***	-0.269	-0.399
	(-3.04)	(-2.94)	(3.15)	(3.07)	(-3.39)	(-3.62)	(-0.92)	(-1.41)
dE(t+1)	2.487***	2.164***	2.339***	1.771***	1.948***	1.736***	1.366***	1.126***
	(23.74)	(22.83)	(14.32)	(12.43)	(10.36)	(11.93)	(6.74)	(7.03)
dNA(t)	0.329***	0.312***	0.819***	0.712***	0.228***	0.228***	0.600***	0.497***
	(9.04)	(10.66)	(8.17)	(7.64)	(11.78)	(11.19)	(5.90)	(5.24)
dNA(t+1)	0.579***	0.646***	0.447***	0.558***	0.568***	0.583***	0.461***	0.510***
	(6.84)	(8.56)	(4.05)	(4.78)	(7.07)	(7.49)	(3.72)	(3.89)
RD	5.022***	4.280***	5.833***	7.660***	0.979	0.718	5.655***	6.602***
	(19.19)	(11.87)	(10.24)	(11.84)	(1.18)	(0.82)	(7.40)	(7.65)
dRD(t)	1.104**	1.296***	2.195**	2.496**	2.405***	2.281***	3.469**	3.015*
	(2.06)	(2.69)	(2.79)	(2.42)	(4.17)	(4.00)	(2.46)	(1.99)
dRD(t+1)	6.568***	5.454***	8.700***	9.454***	3.025***	2.736***	6.960***	7.736***
	(8.90)	(9.74)	(8.39)	(8.61)	(3.59)	(3.42)	(5.93)	(6.78)
I	-1.318**	-1.706***	0.738	-2.857***	-2.564***	-2.836***	-1.077	-2.992***
	(-2.44)	(-2.64)	(1.01)	(-4.26)	(-4.74)	(-5.58)	(-1.18)	(-3.98)
dI(t)	-0.728	-0.774	-0.590	0.422	1.284**	1.253***	1.719**	2.673***
	(-1.56)	(-1.53)	(-0.44)	(0.48)	(2.46)	(2.61)	(2.28)	(4.01)
dI(t+1)	-3.571***	-4.413***	-2.997**	-5.126***	-2.606***	-3.147***	-1.085	-2.237**
	(-9.35)	(-12.20)	(-2.97)	(-5.02)	(-5.82)	(-7.50)	(-1.02)	(-2.43)
D	0.088	1.152***	6.740***	7.470***	0.629	1.337***	7.197***	7.777***
	(0.20)	(3.13)	(20.94)	(20.69)	(1.25)	(2.93)	(12.06)	(15.53)

(continued)

Table 4: *—continued*

	All firms				Non-U.S. firms			
	FixEf. (level/diff.)		FMBeth (level/diff.)		FixEf. (level/diff.)		FMBeth (level/diff.)	
dD(t)	-0.324 (-1.37)	-0.367* (-1.78)	-2.478*** (-5.13)	-1.853*** (-3.77)	-0.299 (-0.98)	-0.349 (-1.13)	-1.945*** (-4.82)	-1.673*** (-3.86)
dD(t+1)	0.102 (0.55)	0.571*** (3.04)	2.483*** (7.50)	3.393*** (8.65)	0.201 (0.62)	0.494 (1.63)	2.763*** (5.25)	3.263*** (6.12)
dV(t+1)	-0.272*** (-5.66)	-0.305*** (-6.09)	-0.142 (-1.44)	-0.178 (-1.62)	-0.280*** (-4.64)	-0.298*** (-4.86)	-0.186 (-1.35)	-0.209 (-1.46)
dispM	**0.009** (0.42)	**-0.062***** (-4.71)	**-0.033** (-1.00)	**-0.052** (-1.27)	**0.036** (1.28)	**-0.063***** (-3.21)	**0.179***** (3.77)	**0.160**** (3.01)
C	**0.782***** (4.50)		**2.118***** (10.84)		**0.391***** (4.53)		**1.308***** (6.48)	
dC(t)		**1.007***** (12.03)		**2.050***** (6.08)		**0.695***** (7.61)		**1.436***** (4.78)
dC(t+1)		1.009*** (6.88)		1.220*** (4.60)		0.803*** (6.87)		0.847*** (3.95)
C×dispM	**-0.594***** (-3.34)		**-0.326*** (-1.96)		**-1.041***** (-10.24)		**-0.512**** (-2.45)	
dC(t+1)×dispM		**-1.149***** (-5.99)		**-3.400***** (-6.12)		**-0.885***** (-6.52)		**-2.544***** (-4.30)
Const.	0.925*** (21.51)	1.016*** (45.24)	0.535*** (29.21)	0.815*** (36.81)	0.751*** (21.93)	0.945*** (36.47)	0.494*** (24.92)	0.629*** (27.21)
R^2	0.346	0.376	0.433	0.409	0.334	0.351	0.426	0.424
N	29963	29708	29963	29708	19661	19585	19661	19585
Groups	7474	7412	10	10	4991	4970	10	10

This table presents the estimation results with IA for fixed effects regressions (FixEf.) and Fama-MacBeth regressions (FMBeth) over the 1995 to 2005 period. The dependent variable in all specifications is the total market value scaled by total assets. The definitions of all variables are provided in section 3.1.2. Year dummies are included, but are not presented to save space. Statistical inference is based on Driscoll and Kraay (1998). *t*-values are presented in parentheses. The R^2 of the fixed effects regression represents the R^2 of the within-dimension. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 5: Estimated value of cash in different subgroups (sorts by firm characteristics)

		All firms		Non-U.S. firms		U.S. firms	
		FixEf.	FMBeth	FixEf.	FMBeth	FixEf.	FMBeth
Large firms	C	0.467*** (2.68)	2.249*** (8.47)	0.176 (1.63)	1.454*** (5.62)	1.114*** (3.35)	3.647*** (9.33)
	C×dispM	-1.018*** (-4.32)	-0.524 (-0.58)	-1.307*** (-4.38)	-1.539* (-2.04)	0.423 (1.10)	2.181* (2.04)
	N	14979	14979	10432	10432	4547	4547
	Groups	3761	10	2760	10	1007	10
Small firms	C	0.844*** (4.08)	1.919*** (9.38)	0.335** (2.18)	1.088*** (6.32)	1.167*** (4.50)	2.117*** (9.88)
	C×dispM	-0.281 (-1.20)	-0.166 (-0.41)	-0.463*** (-3.49)	0.175 (0.54)	0.041 (0.13)	-0.033 (-0.08)
	N	14984	14984	9229	9229	5755	5755
	Groups	4720	10	2799	10	1926	10
Payout ratio high	C	0.241 (1.39)	0.820*** (4.96)	0.173 (1.10)	0.730*** (5.41)	0.219 (0.78)	1.016*** (4.06)
	C×dispM	-0.250 (-0.79)	-1.631** (-2.58)	-0.299* (-1.73)	-1.299** (-2.42)	0.904*** (3.13)	-1.353** (-2.72)
	N	14862	14862	11095	11095	3767	3767
	Groups	4434	10	3322	10	1114	10
Payout ratio low	C	1.145*** (4.75)	2.780*** (10.36)	0.770*** (3.41)	1.969*** (5.80)	1.416*** (5.37)	3.016*** (11.04)
	C×dispM	-0.658*** (-2.82)	-1.036*** (-5.93)	-1.367*** (-5.83)	-1.280*** (-4.73)	0.062 (0.24)	-0.350 (-1.12)
	N	14867	14867	8372	8372	6495	6495
	Groups	5524	10	3374	10	2156	10
Inside ownership 0-5%	C	0.990*** (5.41)	2.247*** (6.09)	0.529* (1.80)	1.078* (1.84)	1.308*** (5.59)	2.669*** (7.78)
	C×dispM	-1.251** (-2.45)	0.322 (0.27)	-3.038*** (-5.21)	0.489 (0.25)	-1.212* (-1.73)	-0.369 (-0.33)
	N	3326	3326	966	966	2360	2360
	Groups	1144	10	410	10	734	10
Inside ownership 5-25%	C	1.042*** (4.26)	2.671*** (9.79)	-0.061 (-0.29)	1.351** (3.20)	1.463*** (4.83)	2.924*** (9.25)
	C×dispM	-0.501** (-2.28)	0.621 (1.15)	-1.899*** (-3.37)	1.276 (1.23)	0.105 (0.49)	0.742 (1.13)
	N	6559	6559	2809	2809	3750	3750

(continued)

Table 5: *—continued*

		All firms		Non-U.S. firms		U.S. firms	
		FixEf.	FMBeth	FixEf.	FMBeth	FixEf.	FMBeth
	Groups	2563	10	1175	10	1389	10
Inside ownership	C	0.286*** (2.61)	1.974*** (11.40)	0.239** (2.15)	1.092*** (7.63)	0.600 (1.53)	2.842*** (9.57)
+25%	C×dispM	-0.284 (-1.14)	-0.851*** (-3.67)	-0.911*** (-4.20)	-1.438*** (-3.25)	0.436 (1.55)	-0.524 (-1.33)
	N	14787	14787	10857	10857	3930	3930
	Groups	4793	10	3260	10	1537	10

This table shows estimation results with IA for fixed effects regressions (FixEf.) and Fama-MacBeth regressions (FMBeth) for different subsamples over the 1995 to 2005 period. The dependent variable in all specifications is the total market value scaled by total assets. Year dummies and different variables on firm characteristics (as in Tables 3 and 4) are included in all specifications, but are not presented to save space. The definitions of all variables are provided in section 3.1.2. Statistical inference is based on Driscoll and Kraay (1998). T-values are presented in parentheses. . ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 6: Estimated value of cash in different subgroups (sorts by country characteristics)

		All firms		Non-U.S. firms	
		FixEf.	FMBeth	FixEf.	FMBeth
Rule of law index high	C	0.883*** (4.92)	2.427*** (11.10)	0.426*** (4.97)	1.481*** (5.56)
	C×dispM	-0.497** (-2.54)	-0.062 (-0.24)	-0.998*** (-6.93)	0.016 (0.05)
	N	23240	23240	12938	12938
	Groups	5470	10	2986	10
Rule of law index low	C	0.374** (2.34)	0.950*** (5.34)	0.374** (2.34)	0.950*** (5.34)
	C×dispM	-1.281*** (-4.62)	-1.674*** (-3.50)	-1.281*** (-4.62)	-1.674*** (-3.50)
	N	6723	6723	6723	6723
	Groups	2011	10	2011	10
Anti-director rights index high	C	1.028*** (4.99)	2.471*** (10.82)	0.533*** (6.12)	1.213*** (5.18)
	C×dispM	-0.269 (-1.14)	0.055 (0.20)	-0.996*** (-3.66)	-0.008 (-0.02)
	N	17246	17246	6944	6944
	Groups	4217	10	1726	10
Anti-director rights index low	C	0.250** (2.16)	1.353*** (4.79)	0.250** (2.16)	1.353*** (4.79)
	C×dispM	-0.985*** (-5.26)	-0.721* (-1.95)	-0.985*** (-5.26)	-0.721* (-1.95)
	N	11966	11966	11966	11966
	Groups	3048	10	3048	10
Corruption index high	C	0.883*** (4.92)	2.427*** (11.10)	0.426*** (4.97)	1.481*** (5.56)
	C×dispM	-0.497** (-2.54)	-0.062 (-0.24)	-0.998*** (-6.93)	0.016 (0.05)
	N	23240	23240	12938	12938
	Groups	5470	10	2986	10
Corruption index low	C	0.374** (2.34)	0.950*** (5.34)	0.374** (2.34)	0.950*** (5.34)
	C×dispM	-1.281*** (-4.62)	-1.674*** (-3.50)	-1.281*** (-4.62)	-1.674*** (-3.50)
	N	6723	6723	6723	6723
	Groups	2011	10	2011	10
Stock/gdp high	C	0.852*** (4.57)	2.357*** (10.95)	0.378*** (3.54)	1.452*** (5.62)
	C×dispM	-0.436** (-2.43)	-0.071 (-0.29)	-0.861*** (-7.40)	-0.017 (-0.06)

(continued)

Table 6: *—continued*

		All firms		Non-U.S. firms	
		FixEf.	FMBeth	FixEf.	FMBeth
	N	24886	24886	14584	14584
	Groups	5943	10	3458	10
Stock/gdp low	C	0.373***	1.034***	0.373***	1.034***
		(6.90)	(10.15)	(6.90)	(10.15)
	C×dispM	-1.378***	-1.338***	-1.378***	-1.338***
		(-5.59)	(-3.82)	(-5.59)	(-3.82)
	N	5077	5077	5077	5077
	Groups	1539	10	1539	10
Bond/gdp high	C	0.814***	2.430***	0.097	1.418***
		(3.88)	(11.45)	(0.73)	(4.87)
	C×dispM	-0.497**	-0.276	-0.863***	-0.179
		(-2.48)	(-1.54)	(-5.01)	(-0.50)
	N	22494	22494	12192	12192
	Groups	5528	10	3044	10
Bond/gdp low	C	0.619***	1.032***	0.619***	1.032***
		(3.71)	(5.36)	(3.71)	(5.36)
	C×dispM	-0.701***	-1.206*	-0.701***	-1.206*
		(-2.67)	(-2.12)	(-2.67)	(-2.12)
	N	6995	6995	6995	6995
	Groups	1788	10	1788	10
Common law	C	1.045***	2.491***	0.517***	1.164***
		(4.89)	(10.60)	(3.96)	(4.69)
	C×dispM	-0.215	0.078	-0.859***	-0.053
		(-0.91)	(0.27)	(-3.05)	(-0.13)
	N	16008	16008	5706	5706
	Groups	3981	10	1490	10
Civil law	C	0.283***	1.345***	0.283***	1.345***
		(2.70)	(5.28)	(2.70)	(5.28)
	C×dispM	-1.048***	-0.618*	-1.048***	-0.618*
		(-6.94)	(-2.02)	(-6.94)	(-2.02)
	N	13955	13955	13955	13955
	Groups	3506	10	3506	10

This table shows estimation results with IA for fixed effects regressions (FixEf.) and Fama-MacBeth regressions (FMBeth) for different subsamples over the 1995 to 2005 period. The dependent variable in all specifications is the total market value scaled by total assets. Year dummies and different variables on firm characteristics (as in Tables 3 and 4) are included in all specifications, but are not presented to save space. The definitions of all variables are provided in section 3.1.2. Statistical inference is based on Driscoll and Kraay (1998). *T*-values are presented in parentheses. . ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 7: Estimated value of excess cash in connection with IA

	All firms		Non-U.S. firms	
	FixEf.	FMBeth	FixEf.	FMBeth
E	5.440***	2.337***	5.223***	3.207***
	(24.76)	(5.47)	(14.52)	(5.34)
dE(t)	-0.057	1.894***	-0.511*	0.17
	(-0.61)	(5.18)	(-1.68)	(0.39)
dE(t+1)	3.281***	2.681***	2.089***	0.858
	(12.91)	(8.26)	(4.58)	(1.42)
dNA(t)	0.351***	1.076***	0.176***	0.421***
	(2.74)	(8.05)	(3.49)	(4.62)
dNA(t+1)	0.697***	0.634***	0.484***	0.483**
	(6.13)	(4.18)	(3.70)	(2.37)
RD	10.748***	8.183***	8.268***	6.627***
	(6.56)	(11.57)	(3.52)	(5.90)
dRD(t)	-2.088	0.498	0.668	4.338
	(-1.46)	(0.28)	(0.59)	(1.54)
dRD(t+1)	8.260***	9.044***	4.227**	7.444***
	(9.89)	(4.80)	(2.15)	(5.47)
I	-0.775	-4.560***	-2.846	-5.307***
	(-0.73)	(-4.23)	(-1.21)	(-4.99)
dI(t)	0.586	-1.327	3.311***	3.233***
	(0.71)	(-0.65)	(2.83)	(3.51)
dI(t+1)	-2.381***	-8.829***	-1.663	-3.851*
	(-3.49)	(-6.51)	(-1.55)	(-2.09)
D	-2.130***	4.492***	0.511	4.868***
	(-5.12)	(10.51)	(0.94)	(7.14)
dD(t)	-0.215	-2.553**	-0.296	-1.787**
	(-0.76)	(-2.89)	(-0.71)	(-3.21)
dD(t+1)	-1.169***	0.781	0.159	1.294
	(-8.78)	(1.06)	(1.07)	(1.67)
dV(t+1)	-0.274***	-0.136	-0.154*	-0.048
	(-4.09)	(-1.26)	(-1.78)	(-0.29)
dispM	-0.007	-0.034	0.04	0.131
	(-0.16)	(-0.29)	(0.66)	(1.29)
ExCash	1.905***	3.083***	1.299***	2.036***
	(8.84)	(14.82)	(7.41)	(9.78)
ExCash×dispM	-0.479**	-0.42	-0.776***	-1.016**
	(-2.23)	(-0.49)	(-2.80)	(-2.35)
Const.	1.182***	1.063***	0.948***	1.019***
	(14.83)	(21.59)	(19.28)	(28.36)
R^2	0.444	0.589	0.362	0.617
N	10876	10876	6569	6569
Groups	3455	10	1895	10

This table shows the results of fixed effects regressions (with year dummies) and Fama-MacBeth regressions over the 1995 to 2005 period. The dependent variable is the total market value scaled by net assets. The explanatory variables are defined in section 3.1.3. T-values are based on Driscoll and Kraay (1998) and are presented in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 8: Estimated value of cash in different subgroups (country characteristics)

		All firms		Non-U.S. firms	
		FixEf.	FMBeth	FixEf.	FMBeth
Rule of law index high	ExCash	1.952*** (6.59)	3.172*** (12.55)	1.165*** (5.82)	2.164*** (7.76)
	ExCash×dispM	-0.317* (-1.70)	0.194 (0.16)	-0.258 (-0.89)	-1.175* (-1.89)
	N	8513	8513	4206	4206
	Groups	2768	10	1207	10
Rule of law index low	ExCash	1.403*** (5.68)	1.738*** (5.77)	1.403*** (5.68)	1.738*** (5.77)
	ExCash×dispM	-1.982*** (-5.28)	-0.112 (-0.10)	-1.982*** (-5.28)	-0.112 (-0.10)
	N	2363	2363	2363	2363
	Groups	688	10	688	10
Anti-director rights index high	ExCash	2.155*** (6.17)	3.370*** (13.27)	1.948*** (6.76)	2.435*** (6.29)
	ExCash×dispM	-0.26 (-1.15)	0.051 (0.04)	-1.241 (-1.51)	-0.552 (-0.42)
	N	6578	6578	2271	2271
	Groups	2288	10	723	10
Anti-director rights index low	ExCash	0.929*** (7.56)	1.884*** (8.93)	0.929*** (7.56)	1.884*** (8.93)
	ExCash×dispM	-0.446** (-2.27)	-1.478** (-2.71)	-0.446** (-2.27)	-1.478** (-2.71)
	N	4295	4295	4295	4295
	Groups	1170	10	1170	10
Corruption index high	ExCash	1.929*** (6.34)	3.180*** (12.71)	0.977*** (5.70)	2.078*** (8.28)
	ExCash×dispM	-0.283 (-1.45)	0.193 (0.16)	-0.034 (-0.11)	-0.941 (-1.49)
	N	8442	8442	4135	4135
	Groups	2769	10	1208	10
Corruption index low	ExCash	1.802*** (4.42)	1.895*** (5.72)	1.802*** (4.42)	1.895*** (5.72)
	ExCash×dispM	-2.563*** (-5.54)	-0.367 (-0.36)	-2.563*** (-5.54)	-0.367 (-0.36)
	N	2434	2434	2434	2434
	Groups	689	10	689	10
Common law	ExCash	2.157*** (6.00)	3.344*** (13.11)	1.934*** (6.11)	2.525*** (6.24)
	ExCash×dispM	-0.197 (-0.88)	0.155 (0.11)	-0.986 (-1.11)	-1.251 (-0.92)
	N	6256	6256	1949	1949

(continued)

Table 8: *—continued*

		All firms		Non-U.S. firms	
		FixEf.	FMBeth	FixEf.	FMBeth
	Groups	2191	10	626	10
Civil law	ExCash	0.934***	1.910***	0.934***	1.910***
		(7.79)	(8.95)	(7.79)	(8.95)
	ExCash×dispM	-0.492**	-1.476**	-0.492**	-1.476**
		(-2.55)	(-2.69)	(-2.55)	(-2.69)
	N	4620	4620	4620	4620
	Groups	1269	10	1269	10
Stock/gdp high	ExCash	1.948***	3.170***	1.041***	2.086***
		(7.48)	(13.26)	(9.35)	(12.44)
	ExCash×dispM	-0.329	0.115	-0.457	-0.181
		(-1.41)	(0.11)	(-1.51)	(-0.29)
	N	8738	8738	4431	4431
	Groups	2819	10	1258	10
Stock/gdp low	ExCash	1.643***	1.975***	1.643***	1.975***
		(3.67)	(3.88)	(3.67)	(3.88)
	ExCash×dispM	-1.912**	-2.910*	-1.912**	-2.910*
		(-2.27)	(-2.11)	(-2.27)	(-2.11)
	N	2138	2138	2138	2138
	Groups	639	10	639	10
Bond/gdp high	ExCash	1.861***	3.138***	0.748***	1.769***
		(6.71)	(13.84)	(8.19)	(8.67)
	ExCash×dispM	-0.325	-0.171	-0.291	-1.164*
		(-1.26)	(-0.18)	(-1.37)	(-2.05)
	N	8285	8285	3978	3978
	Groups	2623	10	1061	10
Bond/gdp low	ExCash	1.847***	2.199***	1.847***	2.199***
		(5.80)	(5.84)	(5.80)	(5.84)
	ExCash×dispM	-1.194*	0.063	-1.194*	0.063
		(-1.67)	(0.06)	(-1.67)	(0.06)
	N	2454	2454	2454	2454
	Groups	787	10	787	10

This table shows estimation results with IA for fixed effects regressions (FixEf.) and Fama-MacBeth regressions (FMBeth) for different subsamples over the 1995 to 2005 period. The dependent variable in all specifications is the total market value scaled by total assets. Year dummies and different variables on firm characteristics (as in Tables 3 and 4) are included in all specifications, but are not presented to save space. The definitions of all variables are provided in section 3.1.2. Statistical inference is based on Driscoll and Kraay (1998). *T*-values are presented in parentheses. . ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 9: Robustness tests

		All firms	Non-U.S. firms
Panel A (Base case)	C	0.782***	0.391***
		(4.50)	(4.53)
	C×dispM	**-0.594*** **	**-1.041*** **
		(-3.34)	(-10.24)
	N	29963	19661
	Groups	7474	4991
Panel B (2-year lags)	C	0.512**	0.296**
		(2.22)	(2.05)
	C×dispM	**-0.804*** **	**-0.754*** **
		(-4.15)	(-9.51)
	N	22908	15182
	Groups	6072	4135
Panel C (No time dummies)	C	0.839***	0.566***
		(4.65)	(6.54)
	C×dispM	**-0.587*** **	**-1.163*** **
		(-2.97)	(-9.17)
	N	29963	19661
	Groups	7474	4991
Panel D (Pooled OLS)	C	2.281***	1.501***
		(19.28)	(10.79)
	C×dispM	**-0.610** **	**-0.479* **
		(-2.31)	(-1.83)
	N	29963	19661
	Groups	7474	4991
Panel E (Volatility)	C	0.567**	0.215*
		(2.34)	(1.73)
	C×dispM	**-0.687*** **	**-1.205*** **
		(-3.72)	(-14.97)
	Vola	-0.322**	-0.129
		(1.98)	(0.79)
	C×Vola	1.534	1.730**
		(1.58)	(2.00)
	N	29559	19441
	Groups	7408	4961
Panel F (Forecast error)	C	0.797***	0.266**
		(4.85)	(2.54)
	C×ForecastError	**-0.237** **	**-0.266*** **
		(-2.06)	(-2.43)
	N	31370	20452
	Groups	8016	5354

This table provides an overview of the estimation results for different robustness tests. The sample period is from 1995 to 2005. The regression specifications are explained in section 4.3. The dependent variable in all specifications is the total market value scaled by total assets. The definitions of all variables are provided in section 3.1.3 and section 4.3, respectively. Statistical inference is based on Driscoll and Kraay (1998) (Panels A, B, C, E, F) and on White (1980) (Panel D). T-values are presented in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

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