Analysts and Corporate Liquidity Policy*

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Abstract:
This paper examines how equity analysts affect corporate liquidity policy and the value of cash. Greater analyst coverage reduces information asymmetry between a firm and outside shareholders and enhances the monitoring process, in turn increasing the value of cash and allowing firms to hold more cash. The cash-to-assets ratio increases by 5.2 percentage points when moving from the bottom analyst-coverage decile to the top decile. The marginal value of $1 of corporate cash holdings is $0.95 for the bottom analyst-coverage decile and $1.82 for the top decile. The positive effects are robust to a battery of endogeneity checks. We also perform tests employing a unique dataset consisting of public and private firms, which suggest that observed differences in cash policy may largely be attributable to analyst coverage in public firms. These findings constitute new evidence on the real effects of analyst coverage and the channels through which they occur.

Keywords: cash holdings, analyst, information asymmetry, monitoring, private firms
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1. **Introduction**

Given the substantial increase in corporate cash holdings over the last three decades (Bates, Kahle and Stulz (2009)), corporate liquidity decisions have mounting implications for the information environment and agency costs faced by shareholders of public companies. Cash gives firms investment flexibility without the additional scrutiny and information disclosures associated with accessing external financing markets. The notion of specialized financial intermediaries as corporate monitors, however, has persisted since at least the work of Jensen and Meckling (1976). Security analysts, in their role as information intermediaries, are thought to amalgamate and distill private information in a manner that informs pricing, thereby limiting managerial discretion.[1] Corporate cash policy, therefore, seems an ideal setting to assess the role and value of financial analysts on real corporate decisions. In this paper, we examine the impact of analysts on corporate cash policy and the associated value of cash.

We provide evidence that analysts have a direct effect on corporate cash policy. We find that firms with higher levels of analyst coverage are able to hold larger cash reserves and have a higher value associated with cash holdings. These effects are stronger for firms with higher R&D expenditures, where information asymmetry is likely heightened, and for firms with weaker governance, where the agency costs associated with cash holdings are likely the most significant. We verify our findings using a variety of empirical approaches. We also examine the effect of analyst coverage on firms' accumulation of excess cash, given that excess cash is subject to the greatest potential agency conflicts. Our findings suggest that analysts also limit a firm's holdings of excess cash. Finally, we compare the cash policies of private and public firms with and without analyst coverage. Differences in cash holdings between public and private firms are commonly attributed to large differences in their information environments, agency conflicts, and access to capital.

[1] See, for example, Grossman and Stiglitz (1980), Healy and Palepu (2001), Lang, Lins, and Miller (2004), and Frankel, Kothari, and Weber (2006).

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Controlling for these differences we find that public firms with analyst coverage hold significantly higher cash balances relative to private firms and public firms with no analyst coverage. This result suggests that much of the difference in cash holdings between public and private firms can be attributed to the role of analysts in public firms.

The prior literature suggests that analyst coverage can enhance firm value through a number of channels. Chung and Jo (1996) find that R&D, advertising, and Tobin's Q increase with the number of analysts following the firm. Dyck, Morse, and Zingales, (2010) emphasize the role of analysts in uncovering major corporate fraud. Lang, Lins, and Miller (2003) note that value for cross-listed firms is increasing in analyst coverage and forecast accuracy. Yu (2008) and Lindsey and Mola (2012) contend that analysts can have a disciplining effect on the practice of earnings management. Overall, the interpretation and dissemination of information proffered by analysts is thought to improve the credibility of management disclosures and enhance investor cognizance (Abarbanell, Lanen, and Verrecchia (1995), Healy and Palepu (2001)).[2]

Analysts can also play a negative role in markets. Analysts may pressure managers to focus excessively on meeting short-term earnings targets at the expense of long-term value maximization (Fuller and Jensen, 2010; Chapman and Steenburgh, 2011).[3] A comprehensive survey of CFOs by Graham, Harvey, and Rajgopal (2005) shows that CFOs would consider limiting investment to meet analysts' forecasts. Well-documented conflicts of interests and career concerns also reduce the speed and accuracy of information reaching the market (Michaely and Womack (1999), O'Brien, McNichols, and Lin (2005), Barber, Lehavy, and Trueman (2007), and Hong and Kubik (2003)).

These conflicting views regarding the influence of analysts' raise questions about the net effect of analysts on the firm. More importantly, direct evidence on the role of analysts in determining corporate policies and their associated value to shareholders is limited. Kelly and

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[2] In addition, analyst reports have been shown to influence stock price (e.g., Schipper, 1991; Givoly and Lakonishok, 1979; and Womack, 1996).

[3] See Browning, E.S, "The Downside of Optimism on Earnings," *Wall Street Journal*, April 12, 2010

Ljungqvist (2012) find that an exogenous decrease in analyst coverage increases information asymmetry and the cost of capital for firms. Derrien and Kecskés (2012) consider the impact of changes in the cost of capital on corporate investment, financing, and payout policies and find that the loss of analyst coverage has greater impact on firms with higher information asymmetry. Doukas, Kim, and Pantzalis (2008) provide evidence that analyst coverage is associated with increased capital expenditures and external financing, and Chang, Dasgupta, and Hilary (2006) examine the relation between analyst coverage and capital structure.

Our focus is on the liquidity policy of firms. Myers and Rajan (1998) propose that greater liquidity can provide an incentive for managers to engage in self-dealing, whether through excessive pay, perquisite consumption, or an increase in investment in specific assets that reduce liquidation value. Evidence consistent with the agency costs of cash includes Harford (1999), who documents that cash-rich firms are more likely to make value-decreasing acquisitions, Masulis, Wang, and Xie (2007), who show that acquiring firms with less disciplinary power from the market experience lower announcement abnormal returns, and Fayele (2004), who argues that holding more cash leads to a higher likelihood of a proxy fight and subsequent executive turnover. Agency costs have implications for the value of cash as well. Dittmar and Mahrt-Smith (2007) assert that the value of cash is lower when a firm is poorly governed, and Pinkowitz, Stulz, and Williamson (2006) find the value of cash holdings is lower in countries with poor investor protection.

Companies also hold cash for productive reasons. Mikkelson and Partch (2003) examine companies with large cash holdings and find that these companies do not underperform their peers. Bates, Kahle, and Stulz (2009) find that precautionary motives largely explain the substantial increase in cash holdings from 1980 to 2006.[4] When companies are financially constrained, cash holdings can be a buffer against unexpected operating losses and forestall inefficient closure

[4] Lai, Sodjahin, and Soumaré (2010) find firms' cash holdings increase with non-business idiosyncratic risk, and this relation increases with analyst coverage.

(Morellec and Nikolov (2009)). Managers also hold cash to fund growth opportunities and insure against unexpected losses from operations in an economic downturn (Campello, Graham, and Harvey (2010), Hugonnier, Malamud, and Morellec (2011)). Thus, the extent to which analysts reduce the agency costs of cash and improve the marginal value of cash remains an important question.

We first examine whether analyst coverage affects corporate cash policy. We hypothesize that greater analyst coverage reduces information asymmetry and enhances monitoring, increasing the marginal value of cash holdings. In response, firms increase cash holdings as the benefits from holding additional cash outweigh the costs. Using information Thomson Reuters I/B/E/S, CRSP and Compustat, we construct a sample of 94,636 firm-year observations spanning 1984 to 2009. We employ the model of Bates, Kahle, and Stulz (2009), augmented with information about analyst coverage, to study the relationship between analyst following and cash holdings. We find cash holdings increase with analyst coverage. When moving from the lowest to the highest decile of analyst coverage, the cash-to-assets ratio increases by 0.052, or roughly 31% of the sample mean.

To study how information and monitoring effects contribute to the positive relation between analyst coverage and cash holdings, we follow Faulkender and Wang (2006) and model the change in firm value as a function of the change in corporate cash holdings to determine the marginal value of cash. When we interact the change in cash holdings with analyst coverage, we find that analysts have an economically significant positive effect on how shareholders value incremental cash holdings. For example, when we compare the lowest coverage to the highest-coverage decile, the value of an additional dollar of cash increases by almost 90 cents.

We find that the positive effect on the value of cash is attributable to analysts' roles as information intermediaries and monitors. Using higher levels of R&D expenditures to proxy for heightened information asymmetries, we find that the value of cash and the level of cash holdings are higher for firms with relatively higher R&D expenditures and greater analyst following. Similarly, firms facing higher agency costs, as measured by traditional governance indexes, also experience a larger increase in the level and value of cash when they have a greater analyst following.

We also examine the monitoring role of analysts by considering the likelihood and extent to which firms in the sample accumulate excess cash. Our findings show that analysts prevent firms from holding excess cash. Our examination further suggests that the marginal value of cash can be diluted when firms hold a considerable amount of excess cash, but that the negative impact of excess cash can be lessened given the monitoring effect of analysts.

Our results hold under a variety of robustness checks. Naturally, analysts may be attracted to covering firms with a particular set of characteristics, some of which may be unobservable (Bhushan (1989)). We estimate our main models using an instrumental variables approach, using the lagged industry median number of analysts and trading volume as sources of exogenous variation. In addition, we study the time-series effect of analyst coverage by examining the impact of a change in analyst coverage on the change in cash holdings. We apply this difference in differences and instrumental variable approach simultaneously and find a positive incremental effect of a change in analyst coverage on a change in cash holdings. We further verify a causal interpretation using the exogenous loss methodology of Hong and Kacperczyk (2010). In addition, we relate the impact of analyst coverage on cash holdings using the impact of Regulation Fair Disclosure (Reg-FD) on analysts' activities. Our results suggest a temporarily lower impact of analyst coverage on corporate cash policy immediately after Reg-FD, combined with its gradual resumption in the longer term, which confirms the positive relationship between cash holdings and analyst coverage.

Last, we employ a unique dataset comprised of a set of public and private firms to further explore the benefits and economic significance of analyst coverage on the cash policy of public firms. Given less public information, private firms suffer from greater information asymmetry, which results in a higher cost of external capital. In addition, given their concentrated ownership structure, private firms have lower agency conflicts. Presumably, therefore, private firms would tend to rely more on leverage and precautionary cash balances for investment. We find, however, that public firms hold roughly 8% more cash than do their private counterparts, a finding that is robust to using propensity score matching to control for differences in characteristics between public and private firms. To isolate differences that may stem from disclosure or agency, we re-estimate the differences in cash holdings for private firms and public firms with no analyst coverage, and find that they are roughly one third of the difference observed for all public firms. This result is consistent with the notion that analysts substantially attenuate the agency conflicts associated with diffuse ownership in public corporations and also suggests that the benefits of transparency associated with public filings and market issuance are quite limited. In addition, we observe that firms tend to hold more cash while public than after they go private.

This paper makes a number of contributions to the literature. First, we provide evidence that analysts have a significant impact on corporate liquidity choices which adds to the nascent literature concerning the effects of analyst coverage on corporate policies. Second, by showing that analysts increase the value of cash holdings, this paper substantiates a channel through which the change in cash policy occurs and through which analysts improve firm value. As such, we also contribute to the literature on the monitoring role of security analysts by emphasizing the extent and economic significance of analyst coverage. Moreover, this paper contributes to the growing literature on precautionary motives for cash holdings and corporate cash policy, providing empirical support regarding how information asymmetry and agency conflicts affect precautionary and excess cash savings. Finally, this paper is one of the first studies on cash policy for both public and private firms and for going-private firms and provides evidence that analysts play a first-order role in determining the differences in cash holdings between public and private firms.

The remainder of this paper is organized as follows. Section 2 describes the data used in the analysis. Section 3 presents and discusses findings on the relationship between analyst coverage and cash holdings in public firms. Section 4 studies the impact of analysts on excess cash accumulation.

In Section 5, we examine differences in cash holdings for public and private firms. Section 6 concludes.

2. Data

We compile data from a number of publicly available sources. Analyst coverage information is taken from the Thomson Reuters I/B/E/S Detail History file. The CRSP/Compustat merged database provides accounting information, and stock returns are from CRSP. To appear in the sample, we require firms to have positive total assets (Compustat item #6) and positive sales (Compustat item #12). Following the literature, we exclude financial firms (SIC codes 6000 - 6999) and utilities (SIC codes 4900 - 4999) since capital requirements and regulation may determine liquidity decisions for these firms. Our sample period spans from 1984 to 2009, yielding 94,636 firm-year observations for 10,589 firms. We augment this data with governance information from Riskmetrics and institutional holding information from the Thomson-Reuters Institutional Holdings (13F) database where available.[5]

Coverage is defined as the total number of analysts covering a firm in a given fiscal year. For use in the analysis, we calculate the natural logarithm of 1 plus the number of analysts. To ease interpretation, we also sort firms into deciles by analyst coverage. We number the deciles from 0 to 9 and divide by 9 for use in the regressions.

We follow Opler et al. (1999) and Bates et al. (2009) in defining variables that influence the level of a firm's cash holdings. We define Cash as cash and marketable securities divided by book assets (#1 / #6). To control for volatility of cash flows, we compute industry sigma. For each firm in a given year, we obtain the standard deviation of its cash flow to net assets ratio ((#13 - #15 - #16 - #21) / (#6 - #1)) for the previous 10 years, requiring at least 3 observations. We then average the

[5] Capital IQ is the data source for the private firm analysis, which will be discussed in detail in Section 5.

standard deviation measure for each two-digit SIC code to obtain the industry cash flow volatility for a given firm. We control for growth opportunities using the market to book ratio (M/B). M/B is computed as the book value of assets minus the book value of equity plus the market value of equity divided by the book value of assets ((#6 - #60 + (#199 * #25)) / #6). Firm size is computed as the logarithm of the book value of assets in 2004 dollars (log(#6)).

We also control for a variety of firm-specific liquidity measures. Cash flow is defined as earnings before depreciation minus interest, dividends, and taxes divided by book assets ((#13 - #15 - #16 - #21) / #6). We define NWC as net working capital minus cash plus marketable securities divided by book assets ((#179 - #1) / #6). CAPX is computed as capital expenditures divided by book assets (#128 / #6). Leverage is long-term debt plus short-term liabilities divided by book assets ((#9 + #34) / #6). R&D is computed as the ratio of R&D to sales (#46 / #12) and set to zero if missing. A dividend dummy equals 1 if the firm pays a dividend for a given year. AQC is computed as acquisition expense to book assets (#129 / #6).

We follow Faulkender and Wang (2006) to assess the role of analyst coverage on the marginal value of cash holdings. We define Excess Return as the firm-year stock return less a matched portfolio return based on Fama-French (1993) size and book-to-market portfolios. We also define a number of variables based on changes in accounting information, all of which are normalized by the lagged market value of the firm: Δ Cash is the change in cash plus marketable securities, Δ Earnings is the change in earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, Δ Net Assets is the change in total assets minus cash, Δ R&D is the change in research and development expenses, Δ Interest Expense is the change in interest paid, and Δ Common Dividends Paid is the change in dividends paid to common shareholders. Leverage is defined as long-term debt plus short–term debt divided by the sum of long-term debt, short-term debt, and the market value of equity. Net financing is total equity issuances less repurchases plus debt issuances less redemptions. All accounting variables are winsorized at the 1st and 99th percentiles.

We incorporate additional variables to measure alternate sources of monitoring. Following Cremers and Nair (2005), we compute institutional block holdings as the sum of all institutional owners that hold more than 5% of a firm's equity from Thomson-Reuters Institutional Holdings (13F) database. We also consider the G-index from RiskMetrics as a measure of agency conflicts. Following Gompers, Ishii, and Metrick (2003) the G-index is constructed as the number of anti-takeover provisions (between 0 and 24) associated with the firm. For ease of interpretation, we split the sample into terciles based on institutional block holdings and the G-index. The middle tercile is dropped from the analysis. The indicators are equal to one for firms in the *top* tercile of institutional block holdings and the *bottom* tercile of the G-index, 0 otherwise.

For robustness, we also define measures as instruments to allow for causal interpretations. We define Lagged Industry Median Coverage as the median number of analysts following firms in the same two-digit SIC code in the prior year and Lagged Volume as the number of shares traded on the listed exchange in the prior year for a given firm, in millions. Both of these correlate strongly with the level of analyst coverage in the following year, but are uncorrelated with the residual from the cash regressions.

Table 1 presents the descriptive statistics for the 94,636 observations in the sample. The average (median) cash holding for the firm-years in the sample is 16.6% (8.4%) of total assets. For the median firm-year, a firm is covered by three analysts, has institutional block ownership of approximately 7.6%, and a G-index of 9. Figure 1 shows the average cash holdings across analyst coverage deciles in each firm size tercile based on the book value of assets. Figure 1 confirms that small firms hold more cash, as in Bates, Kahle, and Stulz (2009). If the information environment is important to firms in setting cash policy, one would expect the impact of analysts to be more pronounced for smaller firms. For the smallest firms, we indeed observe a clear upward trend of the level of cash holdings when moving from the lowest- to the highest-analyst coverage decile. The medium- and large-size groups also exhibit a positive relationship between analyst following and cash holdings. In an unreported specification we find that a simple regression of cash holdings on a constant and analyst coverage for each size group yields a significant and positive coefficient for each.

3. Analyst Coverage and Cash Holdings

In this section, we first examine the relation between analyst coverage and the level of a firm's cash holdings by augmenting the model of Bates, Kahle, and Stulz (2009) with our analyst coverage measures. In addition to OLS specifications, we provide estimates from two-staged least squares estimation and the exogenous loss methodology of Hong and Kacperczyk (2010) to allow for a causal interpretation of our findings. We then outline a variety of additional specifications for robustness checks. Next, we examine the relation between analysts and firm value by determining the marginal value of cash holdings conditional on analyst coverage. Again, we present OLS estimates, an instrumental variables approach, and results for the exogenous loss sample of brokerage closures. Finally, we explore differential effects by segmenting firms according to the degree of information asymmetry or agency conflicts present, as proxied by R&D intensity measures and the quality of governance. If analysts, in fact, play a causal role in determining the level and value of cash holdings, we would expect more pronounced effects for more opaque and poorly governed firms.

3.1 Analyst following and the level of cash holdings

We begin our analysis by estimating the relation between cash holdings and analyst coverage using a model similar to Opler et al. (1999) and Bates et al. (2009) as follows:

$$\begin{aligned} Cash_{i,t} = {} & \mu_t + \mu_j + \beta_1\, Coverage_{i,t} + \beta_2\, Industry\ Sigma_{i,t} + \beta_3\, M/B_{i,t} + \beta_4\, Firm\ Size_{i,t} \\ & + \beta_5\, Cash\ flow_{i,t} + \beta_6\, NWC_{i,t} + \beta_7\, CAPX_{i,t} + \beta_8\, Leverage_{i,t} + \beta_9\, R\&D_{i,t} \\ & + \beta_{10}\, Dividend\ Dummy_{i,t} + \beta_{11}\, AQC_{i,t} + \varepsilon_{i,t} \qquad (1), \end{aligned}$$

where μ_t and μ_j represent year and industry fixed effects, and all additional variables are defined as in Section 2.

Table 2 presents the regression results of cash holdings on analyst coverage and other control variables following Eq. (1). Model 1 of the table summarizes results equivalent to Bates, Kahle, and Stulz (BKS) (2009). For example, firms with higher market-to-book ratios and cash flow volatility hold more cash because of better investment opportunities and precautionary motives. Net working capital is a substitute for cash and thus is negatively correlated with cash. Capital expenditures can be treated as collateral or a source of irregular demand shocks, yielding a negative relation with cash. According to the financing hierarchy model, firms prefer internal finance over debt, which results in a negative relation between cash and leverage. Further, given economies of scale in the transactions demand for cash, the sign of the coefficient on firm size is negative.[6]

Model 2 of Table 2 examines the relation between corporate cash holdings and analyst coverage, with coverage defined as the (log of 1 plus) the number of analysts following a firm in a given year. The result points to a significant and positive relation between analyst following and a firm's cash holdings, all else equal. All other control variables have the expected signs. Model 3 considers the relation between analyst coverage and cash holdings using the analyst coverage decile. The results of Model 3 also indicate that cash holdings are positively related to analyst coverage. The findings of Models 2 and 3 of Table 2 support the hypothesis that firms with more analyst coverage have lower information asymmetries and potential agency conflicts, which leads to more cash holdings. Based on the coefficient of analyst coverage in Model 3, an increase in analyst coverage from the lowest- to the highest-coverage decile is associated with an increase in cash holdings of 5.2 percentage points, or approximately 31% of the sample average of cash balances (0.166). Thus, the

[6] In this and all subsequent models, the intercept is subsumed by industry or year fixed effects.

potential impact of analyst coverage is not only statistically significant but economically important as well.[7]

Internal corporate governance and external monitors, such as well-informed institutional investors, might substitute for analyst monitoring or reduce a manager's ability to build cash balances. Further, analyst coverage might be related to institutional holdings given analysts' relationship with various financial institutions (O'Brien and Bhushan, 1990).[8] In Model 4 of Table 2, we include our institutional block ownership and (transformed) G-index indicator variables as additional controls. Consistent with the prior literature, the sign on the coefficient associated with institutional investors is positive, but not statistically significant.[9] The regression coefficient on the G-index is consistent with the finding of Harford, Mansi, and Maxwell (2008) that poorly governed firms tend to have lower cash reserves. Notably, the coefficient associated with analyst coverage remains essentially unchanged and statistically significant at the 1% level.

Instead of industry fixed effects, Models 5 through 7 of Table 2 consider the effects of analyst coverage while controlling for firm fixed effects. Controlling for firm fixed effects enables us to understand corporate cash holdings with respect to differences in analyst coverage within an individual firm, mitigating concerns about time-invariant unobservable heterogeneity. Model 5 reports results using the number of analysts to measure coverage, Model 6 employs coverage deciles, and Model 7 adds the indicator variables for institutional block holdings and the G-index. The positive relation between cash holdings and analyst coverage is robust to the inclusion of firm fixed

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[7] In untabulated results, we also estimate models with a separate coefficient for each decile of analyst coverage since the benefits of adding more analysts likely diminish as a firm is covered by a considerable number of analysts. We observe a hump-shaped relation between cash holdings and analyst coverage, with the maximum impact reached at the sixth decile group. Coefficients remain positive and significant for each decile.

[8] See, for example, Shleifer and Vishny (1986) who argue that large shareholders play an important role in monitoring. Karpoff, Malatesta, and Walkling (1996) find that firms with greater institutional ownership are more likely to attract proxy proposals initiated by shareholders after poor performance.

[9] In an unreported test, we include institutional holdings as a control without the G-index. The regression result on the coefficient of institutional holdings shows a significant and positive relation.

effects.[10] As might be expected, the magnitudes of the coefficient estimates are lower with firm fixed effects, but remain economically meaningful.

A natural concern is that an omitted factor could simultaneously determine both cash holdings and analyst coverage. We therefore employ two-stage least squares (2SLS) estimation as well as the exogenous loss sample of Hong and Kacperczyk (2010) to enable causal inference. For two-staged least squares, we require instruments correlated with analyst coverage, but uncorrelated with the structural residual of the cash holdings regressions. We use the lagged industry median number of analysts and lagged trading volume as instruments. It is known that analysts select firms in part with an eye toward generating trading revenue. Thus, it is likely that prior trading volume will be correlated with the coverage decision. A priori, there is no reason to expect a relation between trading volume and the residual of the cash holdings regression. Similarly, some industries might attract more analysts due to the incremental value of information. For example, high-tech industries may attract more analysts than manufacturing industries. Moreover, Chugh and Meador (1984) show that analysts emphasize long-term rather than short-term prospects. Hence, the analyst coverage decision is likely to relate to industry-wide incremental value of information value rather than short-term variation in performance. Because of the variety of industry-level controls in the cash holdings equation, the industry median level of coverage is plausibly exogenous to the residual.

In Panel A of Table 3, we report results for our 2SLS estimations. In Column 1, we present the results for the first stage regression predicting analyst coverage defined as the log of the number of analysts covering a firm. Both instruments are positive and highly significant, indicating relevance. The joint F-test of significance is 90.18 with a p-value less than 1%, indicating weak instruments are not a concern. While there is no true test of exogeneity, specifications with multiple instruments allow for tests of statistical exogeneity. In the specification reported in Columns 1 and 2, the Hansen

[10] In untabulated results, we also adopt the Fama-Macbeth regression approach similar to Opler, Pinkowitz, Stulz, and Williamson (1999) and employ the logarithm of cash-to-net assets ratio as an alternative proxy for cash level. In each of these alternative specifications the coefficient on analyst coverage remains positive and significant.

J statistic has a p-value of .35, indicating that we fail to reject the joint null that the instruments are uncorrelated with the error term and correctly excluded from the second-stage equation.

Table 3, Panel A, Column 2 presents the results from the second-stage regression. In this specification, the coefficient on analyst coverage is positive and significant at the 1% level, which is consistent with the causal interpretation of analyst coverage on a firm's cash holdings. We note that the magnitude of the coefficient estimates increase. Estimation with instrumental variables provides causal estimates only for the *local* average treatment effect, thus it is not uncommon for estimates to increase suggesting a differentially stronger effect for some firms.

Columns 3 and 4 in Panel A of Table 3 present results for a specification utilizing analyst coverage deciles. The coefficient on analyst coverage remains positive and significant, and regression diagnostics indicate valid inference, with strong instruments and a failure to reject the joint-null of exogenous instruments. In Columns 5 and 6 of Table 3, we examine the incremental effect of analyst coverage by studying the impact of the change in analyst coverage on the change in cash holdings. We again adopt a two-stage least squares approach using the industry median number of analysts and trading volume as instruments. The estimates indicate that an increase in analyst following is associated with an increase in a firm's cash holdings. Overall, each of the models presented in Table 3 indicate that analyst coverage has a significant impact on the cash holdings of firms.

In untabulated regression analyses, we perform alternate estimations augmented with return volatility as an additional instrument. If one worried that anticipated performance improvements simultaneously determined both the coverage decision and cash holdings, one would expect return volatility to be positively correlated to coverage, and higher risk to correspond to higher anticipated returns. In fact, we observe a negative coefficient on return volatility in predicting analyst coverage, indicating that analysts are perhaps deterred from covering firms with more unpredictable earnings. This suggests that a correlation between anticipated performance and coverage is not driving our results.

For robustness, we also estimate the models of Table 3 using LIML and GMM, and the results are robust to these alternative methods. Further, in untabulated results, we estimate OLS regressions on the lagged number of analysts following the firm. Prior work indicates that with a sufficient lag endogeneity concerns can be ameliorated (Chang, Dasgupta, and Hilary (2006), and Harford, Mansi, and Maxwell (2008)). When we replace analyst following with the one-, two- or three-year lag in analyst coverage, the positive relation between cash holdings and analyst coverage is positive and significant in all three models. Coefficient magnitudes are similar to the OLS specifications in Table 2, with the furthest lag estimate magnitude corresponding roughly to that of the firm fixed-effect specification.

In Panel B of Table 3, we report results following the exogenous loss methodology in Hong and Kacperczyk (2010). To construct the sample, we use 15 mergers of brokerage houses during our sample period that resulted in brokerage closures; events that typically result in the elimination of analysts due to redundancy. We compare firms that are covered by both the acquirer and target before the merger date (the treatment sample) to firms that are covered by neither (the control group). Each firm in the treatment sample is matched with benchmark portfolios obtained by sorting the control group into tercile portfolios by their market capitalization, book-to-market ratio, and leverage. The top portion of Panel B, Table 3 reports the average benchmark-adjusted difference-in-differences in cash holdings from the year before to the year after the merger. The results show that, after the merger, firms hold significantly lower levels of cash regardless of the benchmark portfolio used. Average differences in cash holdings for this narrow sample range from about 1.7 percentage points for the size, M/B, and leverage-matched estimate to 2.6 percentage points for the size and M/B matched estimates. In unreported results, we find that this effect is driven by firms in the lowest quartile of analyst coverage, which experience an average reduction in the cash ratio of approximately 5 percentage points following the loss of an analyst. We also perform a regression interacting the brokerage merger (Merge) instrument with a dummy variable for firms affected by a loss of analyst coverage (Affected). This specification also incorporates all of the controls variables used in Table 2. Results are reported in the lower portion of Panel B, Table 3. The coefficient on the interaction term is negative and statistically significant, indicating that an exogenous loss of an analyst leads to approximately a 2.3 percentage point reduction in the cash ratio. Thus, the exogenous loss sample constructed from brokerage closures further supports the notion of analyst coverage having a causal impact on the level of a firm's cash holdings.

As a final test, we examine effects of analyst coverage on the level of cash holdings around the introduction of Regulation Fair Disclosure (Reg FD), an exogenous event affecting companies' information environment. In late 2000, the US Securities and Exchange Commission approved a number of rules requiring that firms disclose material information to all investors simultaneously rather than allowing selective disclosure to analysts. Although Reg FD increased the quantity of information to the public, it also increased analyst forecast dispersion and limited analysts' ability to form long-term forecasts (Bailey, Li, Mao, and Zhong (2003) and Sidhu, Smith, Whaley, and Willis (2008)). A survey by the Security Industry Association (SIA) shows the quality of information flow decreased after the implementation of Reg FD; however, Mohanram and Sunder (2006) demonstrate that analysts subsequently placed more emphasis on the discovery of firm-specific information. If information quality decreased immediately after Reg FD, we expect the influence of analyst coverage on cash policy would be dampened, at least temporarily. In addition, if analysts adjusted to changes in the information environment, the market may rely more intensively on analysts as information producers, thereby increasing their influence.

Panel C of Table 3 presents results from the analysis of analyst effects after the implementation of Reg FD. We augment the models from Table 2 with an interaction term between the analyst coverage measure and an indicator variable based on the elapsed time after Reg FD. In

Model 1, the indicator is equal to one for firms with fiscal years ending six months after Reg FD. The negative coefficient of the interaction term between analyst coverage and the Post-FD dummy indicates that the impact of analyst coverage declined. In models 2–4, we create a Post-FD dummy equal to one for fiscal year ends 12, 18, and 24 months after Reg FD, respectively. The results on the coefficients of the interaction term reveal a change in sign when moving from the 6- to the 24-month window, and that the impact of Reg FD was, indeed, temporary. These results are consistent with the view that analysts adapted to the noisy information environment associated with the implementation of Reg FD.

In sum, this section of the paper documents the causal and economically significant role of analyst coverage on the level of cash holdings at a firm. The exact channel for this effect remains uncertain. While this effect might stem from a lower cost of capital, which could enable firms to more easily accumulate precautionary reserves, they may also stem from the disciplinary effects associated with the monitoring role of analysts.[11] We would therefore expect the marginal value of cash to be increasing in analyst coverage, and that this effect would be most significant for firms with more opaque investments and greater prospective agency conflicts. We explore these questions in the two subsections that follow.

3.2 Analyst following and the value of cash

If managers hold cash for investment and precautionary motives, and such motives cannot be revealed fully to the market, investors will discount the value of corporate cash holdings. Thus, analyst coverage can reduce information asymmetry around the value of cash holdings on the balance

[11] Of course, reduced information asymmetry and a lower cost of capital could lead firms to hold less cash as they can more easily access capital markets when needed. Access to capital markets is associated with other frictions including underwriting costs and timing that also make cash holdings valuable for firms. Ultimately, the net effect of reduced information asymmetries on a firm's cash policy is an empirical question.

sheet, increasing the value of cash. In addition, analysts can improve the efficient use of cash by constraining managerial discretion, which will also increase the value of cash.

To gauge the effect of analyst coverage on the value of cash holdings, we follow Faulkender and Wang's (2006) approach to estimate the marginal value of cash holdings. If analysts act as information intermediaries and monitors we would expect to see the value of cash increase with analyst coverage. The model is as follows:

$$r_{i,t} - R^B_{i,t} = \mu_t + \mu_j + \beta_1 AC_{i,t} + \beta_2 AC_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_3 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_4 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \beta_5 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \beta_6 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \beta_7 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \beta_8 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \beta_9 \frac{NF_{i,t}}{M_{i,t-1}} + \beta_{10} \frac{C_{i,t-1}}{M_{i,t-1}} + \beta_{11} \frac{C_{i,t-1}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_{12} L_{i,t} + \beta_{13} L_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t} \quad (2),$$

where $r_{i,t}$ is the stock return for firm i during fiscal year t and $R^B_{i,t}$ is the matched portfolio return at year t based on Fama-French (1993) size and book-to-market benchmark. The terms μ_t and μ_j denote year and industry fixed effects respectively. Additional variables include analyst coverage (AC), leverage (L), and net financing (NF), as well as changes in cash holdings (C), earnings (E), net assets (NA), interest expense (I), and dividend payments (D), all as defined as in Table 1. The coefficient of interest is β_2, the regression estimate of the interaction term between change in cash and analyst coverage.

Table 4 presents regression results from Eq. (2). In Model 1 we present a specification identical to Faulkender and Wang (2006), who show that larger cash holdings and higher leverage ratios are associated with a lower marginal value of cash. The results show that an average firm with a leverage ratio of 22.7% and a (lagged) cash level of 17.4% will have a marginal value of cash equal to $1.28 (1.888 – 2.155 * 0.227 – 0.671 * 0.174). In Model 2 we incorporate analyst coverage, as measured by the number of analysts. The coefficient on analyst coverage interacted with the change in cash holdings is positive and statistically significant. Model 3 incorporates analyst coverage deciles into the regression. The coefficient is 0.874 and significant at the 1% level. Using coefficients from Model 3, the marginal value of cash for an average firm is worth $1.40.[12] In moving from the lowest to the highest analyst coverage decile, the marginal value of cash increases from $0.95 to $1.82. This 87-cent difference suggests that the economic impact of analyst coverage on a firm's marginal value of cash is economically positive and significant.

In Model 4 of Table 4 we use an indicator variable to proxy for analyst coverage. In particular, we define analyst coverage equal to one if the number of analysts covering a firm is higher than the sample median. Based on the coefficient for the interaction term between the change in cash and analyst coverage from Model 4, a firm with above median analyst coverage has a marginal value of cash of approximately $1.79.[13]

Dittmar and Mahrt-Smith (2007) find that firms with institutional block holdings or better governance have a higher marginal value of cash. To account for the effects of governance and institutional block holdings on the value of cash, we first sort firms into terciles according to the G-index and institutional block holdings. Following Dittmar and Mahrt-Smith (2007), we drop the middle group and define separate indicators for governance and institutional block holdings for firms in the *bottom* tercile of the G-index and the *top* tercile of institutional block holdings equal to one, respectively. Results that augment Model 4 with interactions of the institutional block and governance indicators with the change in cash are presented in Models 5 and 6 of Table 4. Though we define analyst coverage as an indicator equal to one if the number of analysts covering a firm is higher than the sample median, results are qualitatively similar if we instead use the number or decile measures of Models 2 and 3. Model 5 presents the regression estimates while controlling for effects

[12] (1.545 – 2.185 * 0.227 – 0.583 * 0.174 + 0.874 * 0.506) where 0.506 is the sample mean of analyst coverage as we transform deciles to the range from zero to one.

[13] In unreported results, we substitute an indicator variable equal to one for firms with at least one analyst. The results of this test also indicates that analyst coverage has a positive effect on cash holdings.

from institutional ownership holdings. As seen in Model 5, the sign on the coefficient of institutional holdings interacted with the change in cash holdings is negative, though the coefficient is not significantly different from zero.[14] In Model 6 of Table 4 the coefficient on the G-index indicator interacted with the change in cash holdings is positive. The positive coefficient on the G-index indicator interacted with change in cash suggests well-governed firms have a higher marginal value of cash which is consistent with the findings in Dittmar and Mahrt-Smith (2007). The coefficients on the interaction between change in cash and analyst coverage remain positive and significant in both Models 5 and 6 of Table 4.[15]

To enable causal inference for the effect of analyst coverage on the value of cash holdings, we also estimate the effects from two-stage-least-squares regressions and changes in coverage derived from the exogenous loss sample constructed from brokerage closures. For the 2SLS approach we treat both analyst coverage and the interaction of analyst coverage and the change in cash as endogenous. To over identify the model, we augment our instruments described in Section 3.1 of the paper (lagged industry median number of analysts and trading volume) with the interaction of each of these instruments and the change in cash, a common method for constructing instruments for interaction effects. Results for the basic models (corresponding to Columns 2 and 3 in Panel A of Table 4) estimated via 2SLS are presented in Panel B of Table 4. Columns 1 and 2 present the results for the first stage regressions, and Column 3 presents the value of cash regression. Collectively, the instruments are strong, with a joint F value of 114.41 (p-val<.01), and the Hansen J statistic fails to reject the null (p-val=.29). The coefficient on the interaction term remains positive and significant, indicating that analysts causally influence the marginal value of a firm's cash holdings. Results for the decile specification (Columns 4 though 6) are qualitatively similar.

[14] Liu and Mauer (2011) also report a negative coefficient on the interaction between change in cash and institutional block holdings.

[15] In untabulated results, we include the G-index and institutional block holdings as controls in Models 2 and 3 of Table 4. The results are robust to these alternative specifications. We also replace institutional block holdings with total institutional holdings or pension fund holdings, and the results are essentially unchanged. Also, when controlling for firm fixed effects, the results are qualitatively consistent.

In Panel C of Table 4, we present results from the exogenous loss sample. As discussed in Section 3.1 of the paper, the treatment sample consists of firms that were covered by analysts of both merged brokerages at the time of the merger, and the control sample consists of firms that were followed by neither merged brokerage firm. Because the variable of interest is an interaction between analyst coverage and the change in cash holdings, we rely on the regression methodology rather than on a difference in differences test for matched tercile subsamples since that method would match only on crude changes in cash. Whereas for the cash level regression the variable of interest was a merge indicator interacted with an affected firm indicator, we now examine the triple-interaction term for Merge, Affected firm, and the change in cash. We observe that the triple interaction coefficient is negative and statistically significant at a 99% confidence level, indicating that, on average, the exogenous loss of an analyst results in a reduction in the value of cash.

Taken as a whole, the results presented in this section of the paper demonstrate that analyst coverage has a meaningful impact on the marginal value of cash holdings in a firm. Thus, it is not merely the case that lower costs of capital may enable the building of precautionary reserves and that firms choose to spend from cash when capital costs are higher. Rather, the increased market value of cash holdings enables firms to hold higher levels of cash. It is clear that analysts, therefore, have a direct effect on the liquidity policy of firms.

3.3 Information and monitoring effects

Information asymmetry leads to investors valuing firms at a discount, particularly if the cost to gather, examine, and distribute information is high (Merton (1987)). Analysts, therefore, can increase firm value by reducing information asymmetry in the market and enhancing investor recognition.[16] Given its fungible nature, cash holdings on the balance sheet are one of the most significant sources of asymmetry between managers and investors. If analysts also effectively

[16] See also Brennan and Hughes (1991), Brennan et al. (1993), and Brennan and Subrahmanyam (1995).

monitor management, coverage may also reduce the agency costs of managerial discretion over cash balances increasing the efficiency of liquidity management and the expected value of future investment out of cash. In this subsection, we explore the effects of information asymmetry and governance on the level and value of cash.

We expect analysts' influence on the level of cash and the marginal value of cash to be greater when information asymmetry between firms and market participants are higher. Using R&D expenditures as a measure of information asymmetry and the above median analyst coverage indicator variable, we incorporate an interaction term between analyst coverage and R&D into the cash holdings model of Eq. (1). For this analysis we divide firms into subsamples based on the sample median of R&D each year to estimate the marginal value of cash separately for each group.[17]

Panel A of Table 5 summarizes the results for the regression of the level of cash, augmented with an interaction term between the above median analyst coverage and R&D indicator variables. The positive and significant coefficient indicates that analyst coverage has a greater influence on the cash holdings for firms with relatively high information asymmetry. Panel B of Table 5 summarizes the estimates of the marginal value of cash for firms with high and low information asymmetry. For firms with higher than median analyst coverage, the value of cash reserves increases by an additional \$0.922 (\$0.467) for the high (low) information asymmetry subgroup. We test the equality of coefficients between the two subgroups and obtain a z-statistic of 4.17, which rejects the null hypothesis that the difference of the coefficients is zero (at the 5% significance level). These findings support the view that analysts are associated with both higher levels and a higher marginal value for cash, particularly for firms where information asymmetry between the firm and market participants is the highest.

[17] We also use the Amihud illiquidity measure and bid-ask spread as alternative proxies for information asymmetry. The conclusions from these analyses are qualitatively similar to the results summarized in the paper.

We also expect analysts' monitoring function to be more valuable for firms with greater opportunities for self-dealing. Consequently, we also augment our cash holdings model with an interaction term between analyst coverage and the G-index indicator. We divide firms into two subsamples based on the sample median of the G-index each year to estimate the marginal value of cash for high and low governance groups. The high G-index group (firms whose G-index value is above the sample median) refers to the subgroup with highest potential agency conflicts.

In Panel C of Table 5, we present the regression results. The positive and significant coefficient on the interaction term between analyst coverage and the G-index indicates that the impact of analyst coverage on cash holdings is higher for firms with relatively poor governance. In Panel D, we provide the regression results for the marginal value of cash. For higher levels of analyst coverage, above median number of analysts are associated with incremental value of cash of \$1.673 and \$0.494 for the high and low agency conflict subgroups respectively. The Wald test rejects the null hypothesis that the coefficients of the two interaction terms are equal.[18]

Given that analysts have a greater impact on cash holdings and are associated with a higher marginal value of cash in firms with higher information asymmetry and agency conflicts, our findings support both the information and monitoring role of analysts. These results provide important evidence on the channels through which analysts have an economically meaningful impact on the value of the firm.

4. The accumulation of excess cash

[18] Gompers, Ishii, and Metrick (2010) show that dual-class firms suffer from greater agency costs. Hence, in untabulated results, we separate firms based on dual-class status. We obtain qualitatively similar results in which the marginal value of cash associated with analyst coverage is higher for dual-class firms. We also use the level of excess cash and the number of independent directors as alternative proxies for agency conflict and obtain similar results.

In this section, we examine the effects of analyst coverage on excess cash. Excess cash, defined as cash reserves not required for investment, operations, or hedging, is subject to greater potential agency conflict. If the firm is poorly governed, managers may build excess cash reserves and dissipate them quickly with self-serving expenditures. For example, Harford (1999) shows that cash-rich firms tend to engage in value-destroying acquisitions. Similarly, Harford, Mansi, and Maxwell (2008) find that poorly governed firms squander cash through both acquisitions and capital expenditures, and that the likelihood of these expenditures increases with excess cash. As a result, one would expect investors' valuation of firms' cash holdings to be lower for firms with higher levels of excess cash. Consistent with this view, Pinkowitz, Stulz, and Williamson (2006), Dittmar and Marht-Smith (2007), and Fresard and Salva (2010) show the value of excess cash increases with the quality of governance.

Here, we study the impact of analysts on firms' accumulation of excess cash in an analysis similar to that of Dittmar and Marht-Smith (2007). We also estimate the marginal value of an additional dollar of excess cash and test for interaction effects associated with analyst coverage. We define excess cash as the portion of cash reserves held by firms that is above the predicted level based on the precautionary and transaction cost model (Eq. 1). Specifically, we perform Fama-MacBeth regressions and obtain the predicted level of cash holdings based on the average coefficients. The residual, constructed as actual cash holdings minus predicted cash holdings, is our measure of excess cash.[19]

Panel A of Table 6 shows the association between analyst coverage at time t-1 with the change in excess cash from time t-1 to t. For ease of interpretation, the sample consists only of firms with positive excess cash in a given year, though results are robust to the inclusion of firms with

[19] In untabulated results, we perform different measures of excess cash such as including firm fixed effects in the calculation or using a logarithm of cash/net assets as cash ratio. We also perform a 10-year rolling regression to obtain the average coefficients to allow for the possibility of time-varying effects on the determinants. The results are robust to these different model specifications.

negative excess cash. We include the industry's average change in excess cash to control for industry-wide variation.[20] In the first model, reported in Column 1, the coefficient on the log of analyst coverage is negative and significant at the 1% level. This result suggests that analysts limit managers from accumulating excess cash, which in turn lowers the risk of expropriation. To gauge the magnitude of analysts' monitoring effect, Model 2 replaces the number of analysts with analyst coverage deciles. The results suggest that moving from the lowest to the highest coverage decile, the change in excess cash decreases by fully 24% (0.006 / 0.025).

These results suggest that analysts deter managers from accumulating excess cash. Given that the excess portion of cash generally exhibits the greatest potential for agency conflict, the marginal value of cash should decrease when firms' excess cash reserves increase, which would lead to a negative coefficient on the interaction between change in cash and the amount of excess cash. If analysts serve as monitors, the negative impact of excess cash on the marginal value of cash should be mitigated as the number of analysts increases. To investigate this conjecture, we incorporate the three-way interaction term of coverage, change in cash, and excess cash to the value of cash model from Eqn. 2.

In Model 1 of Panel B, Table 6 we incorporate an indicator for excess cash, which equals one if a firm's excess cash is above the sample median. As shown in the panel, the regression coefficient on the interaction term between change in cash and excess cash is negative and significant. This finding suggests that investors discount incremental cash holdings when firms hold a sizeable amount of excess cash. The positive coefficient (significant at the 1% level) on the interaction term between the change in cash, excess cash, and coverage suggests that analyst monitoring reduces the negative impact of excess cash on the marginal value of cash. Model 2 replicates the specification in Model 1

[20] In untabulated results, we also include firm fixed effects to mitigate concerns about unobserved heterogeneity. The results are robust to this model specification.

but includes only those sample firms with positive excess cash in a given year. The results remain robust under this model specification.[21]

5. Public and private firms

In this section, we compare the cash policies of private and public firms, including public firms that have no analyst coverage. Private firms are more opaque given a lower degree of information disclosure. Under the financing hierarchy framework, private firms should hold more cash, since the cost of raising external capital is higher. Consistent with this notion, Brav (2009) finds that private firms in the U.K. tend to have higher leverage ratios than public firms, are more reluctant to issue into external capital markets, and tend to stockpile more cash in periods of good performance. Bigelli and Sánchez-Vidal (2011) also argue that private firms should hold more cash given a higher level of uncertainty in private firms.

Recent research has also tied the difference in cash holdings between public and private firms to the agency costs of cash. For example, Bharath and Dittmar (2010) find that public firms with high cash holdings and few investment opportunities are more likely to go private. Gao, Harford, and Li (2012) find that private firms hold approximately half as much cash as public firms and conclude that, despite lower financing frictions in public firms, agency conflicts attributable to diffuse ownership causes public firms to hold more cash.

In this section, we test whether analysts play a moderating role in the observed differences in cash holdings between public and private firms. In our analysis, we attempt to identify the relative impact of agency and information costs on the observed differences in cash holdings by comparing private companies to public companies with and without analyst coverage. All else equal,

[21] We also apply the value regression model similar to Fama-French (1998) to examine the impact of analysts' monitoring on the value of excess cash, while controlling for other variables that could affect firm valuation. The results are robust under this setting as well as under different measures of excess cash.

differences in cash holdings for public companies with zero analyst coverage should be largely attributable to agency costs in public firms.

We obtain data for a sample of private firms covered by Capital IQ between 2003 and 2009. We exclude private firms with public debt as well as private investment firms, which may have differences associated with public disclosure. We also exclude financial and utility firms from the sample and firms with less than two annual observations. Firms could self-select to go public or private based on conditions associated with information production, monitoring, access to the capital, liquidity, or the market for corporate control, therefore we also exclude firms that go public and go private during the sample period. Given data restrictions for private firms, we proxy for growth opportunities using three-year growth in sales.

Table 7 presents the descriptive statistics for the 26,853 firm-year observations on the public and private firms in this sample. Panel A provides the number of public and private firms each year. The number of public firms is approximately four times larger than the number of private firms and there are a decreasing number of private firms over time.

In Panel B of Table 7 we present the results of univariate tests of differences in the level of cash holdings and other key firm characteristics between public and private firms. The first two columns report mean (median) statistics for the public and private firms respectively, while the third column provides the t-stat (z-stat based on Wilcoxon's rank sum test) for the differences in mean (median) between the two subsamples. Consistent with Gao, Harford, and Li (2012), our results indicate that public firms, on average, hold approximately twice the level of cash that private firms do. Public firms maintain an average (median) cash-to-assets ratio of 21% (12.9%), whereas private firms hold 10.8% (4.5%), with both differences statistically significant at the 1% level. Differences between public and private firms obtain across all the other characteristics as well, with private firms exhibiting higher growth rates, cash flow, and leverage, and public firms being larger, with higher industry volatility, and greater capital and acquisition expenditures.

Differences in the cash holdings of public and private firms may simply reflect the sharp fundamental differences between public and private firms. To control for these differences we re-estimate Eq. (1) adding an indicator variable equal to one for private firm observations. Table 8, Panel A, Model 1 presents this level of cash regression but excludes firm-year observations for zero coverage public firms. The estimated coefficient of the private-firm dummy is negative and economically significant, indicating that private firms hold roughly 7.9% less cash to assets than do public firms with analyst coverage; about one half of the sample average of the cash-to-assets ratio.

Model 2 of Table 8 expands the sample to all public firms and includes a zero-coverage dummy equal to one when a public firm has no analyst coverage. The estimates indicate that both private firms and public firms with no analyst coverage hold less cash than public firms with at least one analyst. The respective coefficients for the private firm and zero coverage dummy variables are -0.066 and -0.042, suggesting that the observed differences in cash holdings between public and private firms may be largely attributable to analyst coverage in public firms rather than differential access to capital markets or differences in agency costs.[22] Given the difference in mean cash holdings between public and private firms (10.2%), the regression estimate in model 2 indicates that the presence of an analyst can account for approximately 65% of the difference in cash holdings between public and private firms. This result suggests that analysts may substantially attenuate the agency conflicts associated with diffuse ownership in public firms. While public firms also obtain a degree of transparency and monitoring through disclosure and capital market requirements, our results for the zero-coverage public firm subsample suggest that these effects are relatively small.

It is likely that the decision to stay private or go public is endogenous to firm characteristics. One plausible way to take account of self-selection when comparing the cash holdings of public and private firms is to incorporate a propensity score matching methodology following Heckman,

[22] Although the coefficients are somewhat similar in magnitude, the F-test for the equality of the coefficients rejects the null that the coefficients are equal.

Ichimura, and Todd (1997), and Smith and Todd (2005).[23] The propensity score matching method computes the predicted value (probability) of being in the treatment group versus the control group (i.e., private or public firms) based on observable determinants. We use this propensity score matching technique to calculate the probability of being private for each company based on the following probit model:

$$\begin{aligned} Private\ firm_{i,t} = {} & \beta_0 + \beta_1 \log(sales)_{i,t} + \beta_2 R\&D_{i,t} + \beta_3 CAPX_{i,t} + \beta_4 Dividend\ dummy_{i,t} \\ & + \beta_5 3\text{-}yr\ sales\ growth_{i,t} + \beta_6 Cash\ flow_{i,t} + \beta_7 Leverage_{i,t} \\ & + \beta_8 AQC_{i,t} + \beta_9 term\ premium_t + \beta_{10} Default\ premium_t \\ & + Industry\ fixed\ effects + \varepsilon_{i,t} \end{aligned} \quad (3),$$

where the dependent variable is a dummy variable equal to one if a company is private. Except where noted, all variables are defined as in Table 1. Log(sales) is the logarithm of sales plus one, and 3-yr sales growth is the three-year compounded rate. The term premium is the difference in yield spreads between 10-year and 1-year treasury bonds at the fiscal year end. The default premium is the yield spread between BBB and AAA corporate bonds at the fiscal year end.

Having derived the probability of being a private firm, we then match each private firm with a set of public firms with the closest propensity scores using a variety of methods. The one-to-one estimator selects, for each private firm, a public firm with the closest propensity score. The nearest neighbor estimator selects, for each private firm, the *n* number of public firms with the closest propensity scores (*n* = 10, 25, or 50) and calculates an arithmetic average of cash holdings from the *n* number of public firms. The Gaussian estimator takes a kernel-weighted average of cash holdings, applying more weight to public firms with closer propensity scores. The Epanechnikov estimator uses a similar kernel-weighted average of public firms, but specifies a bandwidth equal to 0.01 to set an upper bound on the number of matched public firms. In unreported tests, we also replace the

[23] A potential concern of using the propensity score method is that an unobserved variable could simultaneously affect both being private decision and cash holdings. Following Rosenbaum (2002), we employ a sensitivity analysis to determine the likelihood an unobserved factor simultaneously affecting the assignment process of the treatment (being private) and the outcome variable (cash holdings). We find an unobserved variable is unlikely to alter the findings.

bandwidth of 0.01 with 0.05 and 0.1 and obtain similar results. These various propensity score matching methods mitigate the endogeneity concern arising from differences in observable firm characteristics.

Panel B of Table 8 reports the mean difference of cash holdings between private and all public firms. Across all different estimators, we observe that private firms hold between 6.6% to 8.4% less cash than their matched public counterparts, a result consistent with the findings in Model 1 of Panel A.[24] In the second column of Panel B, Table 8 we again match private firms to public firms on their propensity score, but limit the sample of public firms to firm-years with no analyst coverage. The average difference in cash holdings between public and private firms is approximately 2.5% between the two subsamples. This again illustrates that differences in cash holdings between public and private firms are substantially attenuated in the absence of analyst coverage. The results also suggest that differences associated with disclosure and agency costs in public firms can account for only a relatively small portion of the differences in cash holdings between public and private firms.

6. Conclusion

The prior literature provides conflicting evidence on the economic impact of analyst activity on corporate policies. In this paper, we examine the impact of analysts on corporate cash policy and the associated value of cash. Cash is a unique and important policy variable for shareholders given that it is associated with significant information asymmetries between managers and market participants. Furthermore, cash endows a manager with substantial investment discretion, and therefore is associated with higher expected agency costs.

[24] Each difference is significant at the 1% level, with bootstrapped standard errors computed with 50 replications.

We provide evidence that analysts have a direct effect on corporate cash policy. First, we find that cash holdings increase with analyst coverage, and further, the marginal value of cash is increasing in the number of analysts. This evidence is consistent with the notion that analysts, as information intermediaries and monitors, can substantially reduce market discounts to corporate cash holdings associated with opacity and managerial discretion. We provide more direct evidence that the effect of analysts on the level and value of cash is most pronounced for firms with high R&D expenditures and relatively poor corporate governance. Finally, we show that analysts reduce the likelihood and extent to which firms accumulate excess cash balances, and that analyst coverage reduces the discount applied to excess cash holdings.

We extend our analysis to a unique dataset that comprises a set of public and private firms and explore the extent and economic significance of the impact of analysts' contribution to the information environment on corporate cash policy. Our findings suggest that the presence of analyst coverage explains over two thirds of the difference in cash holdings between public and private firms. All of our findings provide evidence that the information environment and monitoring have a direct impact on corporate cash policy, and that analysts play a meaningful role in reducing the costs associated with these corporate features.

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Figure 1: Cash Holdings by Analyst Following and Firm Size

This figure presents the average cash ratio across firm size terciles and analyst coverage deciles. The cash ratio is defined as cash and marketable securities divided by book assets (Compustat items #1 / #6) and firm size is measured by book assets (Compustat item #6). N1 and N10 refer to the lowest and highest analyst coverage deciles, respectively.

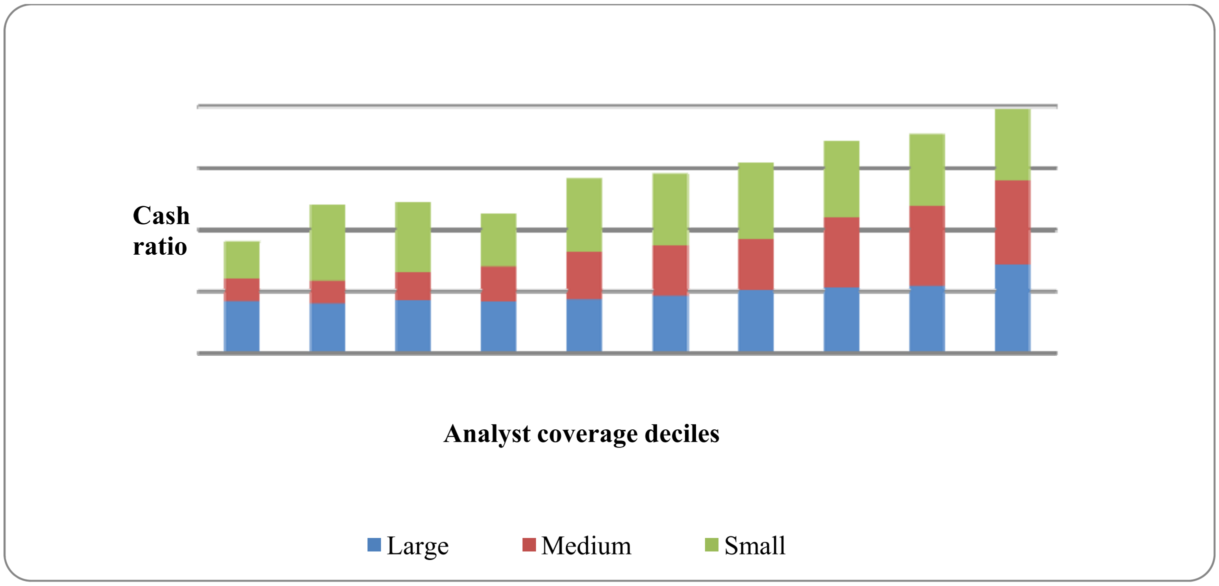

Table 1: Summary Statistics

This table presents the number of observations, mean, median, and standard deviation for all variables in the main sample. An observation is a firm-year for all US companies from 1984–2009, excluding financial firms and utilities (SIC codes 6000-6999 and 4900-4999). The Cash Ratio is cash plus marketable securities divided by the book value of assets (#1 /#6). Coverage is the number of analysts following a firm for a given fiscal year. Industry Sigma is the average of cash flow standard deviations of firms within the same two-digit SIC industry for a given year. M/B is the market-to-book ratio, calculated as the book value of assets less the book value of equity plus the market value of equity divided by the book value of assets ((#6 - #60 + (#199 * #25)) /#6). Firm Size is the logarithm of the book value of assets in 2004 dollars. Cash flow is defined as earnings after interest, dividends, and taxes but before depreciation divided by book value of assets ((#13 - #15 - #16 -#21) /#6). NWC is defined as net working capital minus cash to the book value of assets ((#179 - #1) /#6). CAPX is capital expenditures divided by the book value of assets (#128 /#6). Leverage is computed as long-term debt plus short-term debt book assets divided by the book value of assets ((#9 + #34) /#6). R&D is research and development expenses normalized by sales and set to zero if missing (#46 /#12). Dividend dummy equals one in years in which a firm pays a dividend (#21), 0 otherwise. AQC is the dollar value of acquisitions divided by the book value of assets (#129 /#6). Excess Return is the firm-year stock return less the matched portfolio return based on Fama-French (1993) size and book-to-market portfolios. Change variables are defined as in Faulklender and Wang (2006): Δ Cash is cash plus marketable securities, Δ Earnings is the change in earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, Δ Net Assets is the change in total assets minus cash, Δ R&D is the change in research and development expenses, Δ Interest Expense is the change in interest paid, Δ Common Dividends Paid is the change in dividends paid to common shareholders, all normalized by lagged market value of the firm. Leverage is defined as long-term debt plus short–term debt over long-term debt plus short-term debt plus market value of equity and net financing; Net financing is total equity issuance minus repurchase plus debt issuance minus redemption. Inst. Block Holdings refers to the sum of all institutional ownership positions greater than 5% from Thomson-Reuters Institutional Holdings (13F) Database. G-index refers to Gompers, Ishii, and Metrick managerial entrenchment index from RiskMetrics. Lagged Industry Median Coverage is the median number of analysts following firms in the same two-digit SIC code in the prior year; lagged volume is the number of shares traded on the listed exchange in the prior year, in millions. All accounting variables are winsorized at the top and bottom 1 percentile. The final sample covers 94,636 firm-year observations for 10,589 firms.

Variable	Num. Obs.	Num. Firms	Mean	Median	Stdv.
Cash Ratio	94,636	10,589	0.166	0.084	0.197
Coverage	94,636	10,589	6.219	3.000	8.567
Industry Sigma	94,636	10,589	0.073	0.071	0.027
M/B	94,636	10,589	1.859	1.371	1.524
Firm Size	94,636	10,589	5.372	5.227	2.144
Cash flow	94,636	10,589	0.025	0.064	0.173
NWC	94,636	10,589	0.102	0.085	0.188
CAPX	94,636	10,589	0.063	0.043	0.066
Leverage	94,636	10,589	0.217	0.193	0.188
R&D	94,636	10,589	0.019	0.000	1.154
Dividend dummy	94,636	10,589	0.345	0.000	0.475
AQC	94,636	10,589	0.020	0.000	0.055
Excess Return	93,861	10,578	0.053	-0.053	0.703
Δ Cash	93,861	10,578	0.012	0.001	0.153
Δ Earnings	93,861	10,578	0.025	0.007	0.291
Δ Net Assets	93,861	10,578	0.062	0.040	0.502
Δ R&D	93,861	10,578	0.000	0.000	0.026
Δ Interest Expense	93,861	10,578	0.001	0.000	0.029
Δ Common Dividends Paid	93,861	10,578	0.000	0.000	0.009
Leverage	93,861	10,578	0.227	0.161	0.229
Net Financing	93,861	10,578	0.037	0.001	0.247
Inst. Block Holdings	91,977	10,366	0.115	0.076	0.127
Gindex	19,966	2,473	9.051	9.000	2.737
Lag Ind. Med. Coverage	84128	10,276	1.265	1.386	0.568
Lag Volume (Millions)	84128	10,276	0.384	0.044	1.948

Table 2: Cash Holdings and Analyst Coverage

This table presents OLS regression results for the ratio of cash to assets as a function of analyst coverage. The sample includes all US companies from 1984–2009 with a positive book value and positive sales and excludes financials and utilities (SIC codes 6000 – 6999, 4900 - 4999). Except as noted, the dependent variable and independent variables are defined as in Table 1. Model 1 is the baseline regression. Models 2 and 5 define analyst coverage as the logarithm of the number of analysts plus one. Models 3, 4, 6, and 7 define coverage according to deciles. All ratio variables are winsorized at 1%. T-statistics, based on standard errors robust to heteroskedasticity and firm-level clustering, are in parentheses. ***,**,and * indicate significance at 1%, 5%, and 10% respectively.

Dependent variable: Cash / Assets							
		Coverage Defined As:					
	(1) BKS	(2) Number	(3) Decile	(4) Decile	(5) Number	(6) Decile	(7) Decile
Coverage		0.013***	0.052***	0.051***	0.007***	0.029***	0.030***
		(11.02)	(12.18)	(4.99)	(5.27)	(6.21)	(3.34)
Industry Sigma	0.526***	0.505***	0.500***	0.338***	0.127	0.127	-0.012
	(7.52)	(7.25)	(7.18)	(2.86)	(1.61)	(1.61)	(-0.10)
M/B	0.016***	0.014***	0.014***	0.022***	0.010***	0.010***	0.011***
	(20.12)	(18.40)	(18.27)	(11.49)	(14.56)	(14.50)	(6.62)
Firm Size	-0.006***	-0.012***	-0.012***	-0.029***	-0.003	-0.003*	-0.014***
	(-9.20)	(-14.19)	(-14.75)	(-16.02)	(-1.42)	(-1.66)	(-3.62)
Cash Flow	-0.055***	-0.057***	-0.058***	-0.184***	0.016**	0.016**	-0.003
	(-8.04)	(-8.33)	(-8.47)	(-7.41)	(2.26)	(2.25)	(-0.12)
NWC	-0.296***	-0.300***	-0.301***	-0.323***	-0.275***	-0.275***	-0.295***
	(-41.21)	(-41.75)	(-41.84)	(-20.87)	(-34.07)	(-34.10)	(-14.52)
CAPX	-0.337***	-0.357***	-0.359***	-0.445***	-0.285***	-0.286***	-0.364***
	(-25.49)	(-26.88)	(-27.04)	(-12.51)	(-23.28)	(-23.33)	(-13.04)
Leverage	-0.356***	-0.347***	-0.348***	-0.228***	-0.259***	-0.259***	-0.126***
	(-55.42)	(-53.50)	(-53.70)	(-16.37)	(-34.83)	(-34.90)	(-9.54)
R&D	0.025***	0.025***	0.025***	0.023***	0.009***	0.009***	0.002
	(18.78)	(18.68)	(18.68)	(3.64)	(7.27)	(7.26)	(0.42)
Dividend Dummy	-0.025***	-0.023***	-0.022***	-0.023***	0.005*	0.005*	0.002
	(-9.69)	(-8.84)	(-8.68)	(-5.48)	(1.88)	(1.87)	(0.39)
AQC	-0.212***	-0.223***	-0.225***	-0.260***	-0.181***	-0.181***	-0.200***
	(-24.31)	(-25.14)	(-25.34)	(-17.40)	(-23.36)	(-23.37)	(-14.82)
Inst. Block				0.007			0.004
Holdings				(1.22)			(0.72)
G index				0.026***			0.009
				(4.63)			(1.02)
Observations	94,636	94,636	94,636	19,966	94,636	94,636	19,966
Adjusted R^2	0.507	0.510	0.510	0.564	0.766	0.766	0.830
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes			
Firm FE					Yes	Yes	Yes

Table 3: Cash Holdings and Endogenous Analyst Coverage

This table presents a variety of robustness checks for the relation between cash holdings and analyst coverage. The sample includes all US companies from 1984–2009 with a positive book value and positive sales and excludes financials and utilities (SIC codes 6000 – 6999, 4900 - 4999). Except as noted, the dependent variable and independent variables are defined as in Table 1. All regressions include industry and year fixed effects. Panel A presents regression estimates using a two-stage least squares (2SLS) method with the industry median number of analysts and lagged trading volume as instruments for number of analyst, analyst coverage deciles, and changes in analyst coverage. In the change of cash holdings specification (Columns 5 and 6), other control variables are defined as changes over a two-year time span. Panel B presents results using the brokerage closure exogenous loss mothods of Hong and Kacperczyk (2010). Panel C presents regression estimates with the consideration of the impact of Regulation Fair Disclosure (Reg FD) on analyst coverage. The Post-FDdummy equals one for the 6-, 12-, 18-, and 24-month periods after Reg FD. All ratio variables are winsorized at 1%. T-statistics, based on standard errors robust to heteroskedasticity and firm-level clustering, are in parentheses. ***,**,and * indicate significance at 1%, 5%, and 10% respectively.

Panel A: Two-stage least squares regressions

	Number		Decile		Changes	
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Analyst Coverage	Cash/ Assets	Analyst Coverage	Cash/ Assets	Δ Analyst Coverage	Δ Cash/ Assets
Coverage		0.040***		0.158***		0.058***
		(4.22)		(4.12)		(2.83)
Industry median	0.200***		0.050***		0.044***	
No. of analysts	(13.03)		(12.30)		(10.44)	
Trading Volume	0.025***		0.006***		-0.0003	
	(3.84)		(3.11)		(-0.57)	
Industry Sigma	2.091***	0.483***	0.641***	0.466***	0.267	0.281***
	(3.25)	(6.22)	(3.66)	(5.87)	(0.83)	(3.03)
M/B	0.115***	0.012***	0.032***	0.011***	0.012***	0.009***
	(27.59)	(8.51)	(26.58)	(7.69)	(4.53)	(10.21)
Firm Size	0.411***	-0.024***	0.110***	-0.025***	0.396***	-0.007
	(67.18)	(-5.80)	(67.45)	(-5.59)	(49.06)	(-0.88)
Cash Flow	0.174***	-0.057***	0.062***	-0.060***	-0.186***	0.057***
	(5.21)	(-7.73)	(6.66)	(-7.95)	(-7.53)	(6.00)
NWC	0.328***	-0.307***	0.095***	-0.308***	0.238***	-0.296***
	(8.08)	(-36.37)	(8.39)	(-35.61)	(8.73)	(-27.94)
CAPX	1.551***	-0.412***	0.431***	-0.418***	0.620***	-0.300***
	(16.38)	(-18.71)	(16.23)	(-17.84)	(11.91)	(-15.90)
Leverage	-0.613***	-0.324***	-0.151***	-0.324***	-0.340***	-0.212***
	(-16.08)	(-35.69)	(-14.21)	(-35.81)	(-12.87)	(-20.05)
R&D	0.028***	0.024***	0.008***	0.024***	0.003	0.007***
	(5.59)	(17.56)	(5.70)	(17.39)	(0.70)	(4.61)
Dividend Dummy	-0.165***	-0.016***	-0.049***	-0.014***	0.069***	0.000
	(-9.35)	(-4.86)	(-9.97)	(-4.25)	(5.76)	(0.01)
AQC	0.830***	-0.245***	0.252***	-0.252***	0.038	-0.185***
	(11.92)	(-19.00)	(12.89)	(-17.69)	(0.87)	(-18.41)
Observations	83,595	83,595	83,595	83,595	36,605	36,605
Adjusted R-squared	0.555	0.493	0.519	0.491	0.124	0.101
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Exogenous Loss Sample

Difference-in-Differences (treated$_{t\text{-}t\text{-}1}$ – control $_{t-t\text{-}1}$)	Average	t-statistic
ΔCash / TA (Size-Matched)	-0.021***	-2.61
ΔCash / TA (Size/M/B -Matched)	-0.026***	-2.53
ΔCash / TA (Size/M/B/Leverage -Matched)	-0.017**	-2.21

Regression Method Dependent Variable: Cash/Assets	Coefficient	t-statistic
Merge*Affected	-0.023***	(-2.78)
Merge	0.005	(0.79)
Affected	0.008	(1.47)
Control variables, industry, and merger fixed effects included but not reported		
Observations	2,246	
Adjusted R-squared	0.108	

Panel C: Post-FD Analysis

Dependent variable: Cash / Assets				
	(1) Analyst Coverage (No. of) <= 6	(2) Analyst Coverage (No. of) <=12	(3) Analyst Coverage (No. of) <=18	(4) Analyst Coverage (No. of) <=24
Coverage	0.014***	0.014***	0.014***	0.013***
	(11.72)	(11.64)	(11.44)	(11.32)
Coverage*Post-FDdummy	-0.003*	-0.001	0.002	0.003**
	(-1.67)	(-0.44)	(1.23)	(2.12)
Post-FDdummy	-0.001	-0.005	-0.005*	-0.008**
	(-0.24)	(-1.52)	(-1.71)	(-2.54)
Industry Sigma	0.306***	0.308***	0.309***	0.311***
	(5.56)	(5.59)	(5.61)	(5.64)
M/B	0.014***	0.014***	0.014***	0.014***
	(17.82)	(17.81)	(17.77)	(17.74)
Firm Size	-0.012***	-0.012***	-0.012***	-0.012***
	(-14.87)	(-14.85)	(-14.82)	(-14.80)
Cash Flow	-0.059***	-0.059***	-0.059***	-0.059***
	(-8.67)	(-8.69)	(-8.69)	(-8.70)
NWC	-0.304***	-0.304***	-0.304***	-0.304***
	(-42.40)	(-42.40)	(-42.42)	(-42.42)
CAPX	-0.363***	-0.363***	-0.363***	-0.363***
	(-27.69)	(-27.69)	(-27.70)	(-27.70)
Leverage	-0.350***	-0.350***	-0.350***	-0.351***
	(-54.70)	(-54.71)	(-54.72)	(-54.74)
R&D	0.025***	0.025***	0.025***	0.025***
	(18.86)	(18.86)	(18.86)	(18.86)
Dividend Dummy	-0.023***	-0.023***	-0.022***	-0.022***
	(-8.88)	(-8.88)	(-8.85)	(-8.84)
AQC	-0.221***	-0.221***	-0.221***	-0.221***
	(-25.28)	(-25.28)	(-25.29)	(-25.30)
Observations	94,636	94,636	94,636	94,636
Adjusted R-squared	0.507	0.507	0.506	0.507
Industry FE	Yes	Yes	Yes	Yes

Table 4: The marginal value of cash

This table presents regression results of $r_{i,t} - R^B_{i,t}$ on analyst coverage and changes in firm characteristics. Panel A presents results from OLS estimates. Panels B and C presents results from two-stage-least squares with change in coverage and the interaction of change in coverage and change in cash as endogenous variables and the exogenous loss sample of Hong and Kacperczyk (2010). Panel A, Model 1 is the baseline regression following Faulkender and Wang (2006). Models 2, 3, and 4 define analyst coverage as the logarithm of the number of analysts plus one, deciles, and an indicator for firms with analyst coverage above the sample median each year. Models 5 and 6 include institutional block holdings and governance indicators as controls, respectively. To define the indicators, we separately split the sample into terciles based on institutional block holdings and G-index. The middle tercile is dropped from the analysis. The governance dummy is equal to one for firms in the top tercile of institutional block holdings and the bottom tercile of G-index. All other variables are defined as in Table 1. Regressions include industry and year fixed effects. T-statistics, based on standard errors robust to heteroskedasticity and firm-level clustering, are in parentheses. *** indicates significance at 1%, ** at 5%, and * at 10%.

Panel A: OLS

Dependent variable: excess return $r_{i,t} - R^B_{i,t}$

	(1) Faulkender and Wang	(2) Analyst Coverage (No. of)	(3) Analyst Coverage (Deciles)	(4) Analyst Coverage (Dummy)	(5) Analyst Coverage (Dummy)	(6) Analyst Coverage (Dummy)
Coverage		0.008***	0.033***	0.008**	0.019***	-0.013
		(4.53)	(4.93)	(2.02)	(4.06)	(-1.51)
ΔC_t * **Coverage**		0.267***	0.874***	0.528***	0.532***	0.439*
		(9.29)	(8.00)	(7.00)	(5.83)	(1.94)
Inst. Block Holdings or Gov.					-0.025***	-0.033***
					(-5.21)	(-3.88)
ΔC_t * Inst. Block Holdings or Gov.					-0.119*	0.532***
					(-1.76)	(3.14)
ΔC_t	1.888***	1.654***	1.545***	1.815***	1.834***	1.454***
	(36.25)	(27.93)	(22.60)	(33.14)	(25.74)	(6.50)
ΔE_t	0.470***	0.471***	0.471***	0.471***	0.453***	0.541***
	(28.40)	(28.72)	(28.61)	(28.48)	(23.88)	(9.31)
ΔNA_t	0.220***	0.220***	0.220***	0.220***	0.217***	0.196***
	(23.41)	(23.46)	(23.36)	(23.33)	(20.32)	(6.78)
ΔRD_t	0.186	0.133	0.135	0.167	0.078	0.731
	(1.09)	(0.78)	(0.79)	(0.98)	(0.39)	(1.30)
ΔI_t	-1.887***	-1.896***	-1.896***	-1.896***	-1.883***	-1.902***
	(-14.22)	(-14.35)	(-14.31)	(-14.29)	(-12.42)	(-3.59)
ΔD_t	1.712***	1.742***	1.715***	1.711***	1.990***	2.662***
	(5.70)	(5.80)	(5.72)	(5.69)	(5.84)	(4.10)
NF_t	0.029	0.023	0.024	0.029	0.021	-0.165**
	(1.59)	(1.30)	(1.32)	(1.57)	(1.00)	(-2.58)
C_{t-1}	0.402***	0.411***	0.413***	0.407***	0.390***	0.379***
	(21.85)	(22.40)	(22.37)	(21.98)	(18.58)	(5.99)
ΔC_t * C_{t-1}	-0.671***	-0.599***	-0.583***	-0.619***	-0.622***	-0.633**
	(-8.51)	(-7.58)	(-7.34)	(-7.76)	(-6.76)	(-2.11)
L_t	-0.577***	-0.571***	-0.570***	-0.574***	-0.566***	-0.523***
	(-55.97)	(-54.73)	(-54.62)	(-55.13)	(-46.46)	(-17.98)
ΔC_t * L_t	-2.155***	-2.108***	-2.185***	-2.156***	-2.113***	-1.411***
	(-19.30)	(-18.92)	(-19.66)	(-19.31)	(-15.81)	(-2.94)
Observations	93,861	93,861	93,861	93,861	63,599	12,228
Adj. R-sq	0.231	0.233	0.233	0.232	0.231	0.208

Panel B: Two-stage least squares

Dependent variable: excess return $r_{i,t} - R^B_{i,t}$						
	Number			Decile		
	(1) Analyst Coverage	(2) ΔC_t*Coverage	(3) Cash/Assets	(4) Analyst Coverage	(5) ΔC_t*Coverage	(6) Cash/Assets
Coverage			0.018***			0.045***
			(5.44)			(2.76)
ΔC_t * **Coverage**			0.632***			4.707***
			(6.39)			(4.89)
Industry Median	0.398***	-0.002**		0.102***	0.000	
Coverage	(19.79)	(-2.10)		(19.75)	(0.44)	
ΔC_t * Industry Cov.	0.076**	0.395***		0.023		
	(2.28)	(22.42)		(0.030)		
Trading Volume	0.125***	-0.000		0.033***	-0.000	
	(7.10)	(-0.43)		(6.60)	(-0.15)	
ΔC_t * Trading	-0.088**	0.069***		-0.021*	0.016**	
Volume	(-2.24)	(2.65)		(-1.95)	(2.56)	
ΔC_t	-0.190***	0.369***	1.331***	-0.049***	0.351***	0.036
	(-3.40)	(14.70)	(13.37)	(-3.22)	(53.03)	(0.10)
ΔE_t	-0.040***	0.000	0.471***	-0.012***	0.000	0.471***
	(-3.19)	(0.01)	(28.97)	(-3.61)	(0.04)	(28.62)
ΔNA_t	0.131***	-0.004*	0.221***	0.036***	-0.001**	0.224***
	(13.71)	(-1.94)	(23.59)	(13.75)	(-2.12)	(23.40)
ΔRD_t	1.440***	0.128***	0.077	0.399***	0.039***	-0.019
	(10.31)	(4.13)	(0.45)	(10.44)	(4.70)	(-0.11)
ΔI_t	0.641***	-0.005	-1.899***	0.178***	0.001	-1.902***
	(5.22)	(-0.17)	(-14.39)	(5.25)	(0.10)	(-14.12)
ΔD_t	2.337***	-0.103*	1.812***	0.613***	-0.016	1.834***
	(6.88)	(-1.68)	(6.00)	(6.65)	(-0.94)	(5.96)
NF_t	-0.151***	0.019***	0.014	-0.038***	0.007***	-0.005
	(-7.32)	(5.09)	(0.77)	(-6.67)	(6.69)	(-0.26)
C_{t-1}	-0.816***	-0.021***	0.414***	-0.225***	-0.006***	0.425***
	(-25.06)	(-5.10)	(21.73)	(-25.38)	(-5.34)	(21.11)
ΔC_t * C_{t-1}	-0.104*	-0.357***	-0.500***	-0.034**	-0.108***	-0.201
	(-1.71)	(-17.41)	(-5.94)	(-2.08)	(-20.18)	(-1.57)
L_t	-0.489***	-0.012***	-0.568***	-0.129***	-0.004***	-0.560***
	(-12.25)	(-6.15)	(-52.77)	(-11.90)	(-6.87)	(-49.19)
ΔC_t * L_t	-0.063	-0.027	-2.046***	-0.024	0.046***	-2.320***
	(-0.67)	(-0.63)	(-18.05)	(-0.93)	(4.02)	(-18.73)
Observations	93,860	93,860	93,860	93,860	93,860	93,860
Adjusted R-squared	0.170	0.523	0.229	0.140	0.747	0.201
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel C: Exogenous Loss

Regression Method Dependent Variable: Excess Return $r_{i,t} - R^B_{i,t}$	Coefficient	t-statistic
ΔC_t*Merge*Affected	-1.285***	(-2.43)
Merge	-0.111***	(-3.63)
Affected	0.034	(1.18)
ΔC_t*Merge	-0.263	(-0.69)
ΔC_t*Affected	1.272***	(3.68)
Merge*Affected	-0.012	(-0.27)
Control variables, industry, and merger fixed effects included but not reported		
Observations	2,316	
Adjusted R-squared	0.197	

Table 5: Information and monitoring effects

Panel A and B present the regression results based on the information effect hypothesis using ratio of R&D to sales as a proxy for information asymmetry. Specifically, Panel A presents the results using the cash holdings model following Bates et al. (2009). Following Faulkender and Wang (2006), Panel B presents regression results of $r_{i,t} - R^B_{i,t}$ on analyst coverage and changes in firm characteristics separated into two subgroups based on the yearly sample median of the ratio of R&D to sales. Panel C and D present the regression results based on the monitoring effect hypothesis using the G-index as a proxy for potential agency conflict. Specifically, Panel C presents results using the cash holdings model following Bates et al. (2009). Following Faulkender and Wang (2006), Panel D presents the regression results of $r_{i,t} - R^B_{i,t}$ on analyst coverage and changes in firm characteristics separated into two subgroups based on the sample median each year of the G index. The last column of panels B and D presents the χ^2 statistics (p-value in parentheses) from the Wald test for testing the equality of coefficients of ΔC_t*Coverage of the two subgroups. All variables are winsorized at the top and bottom 1 percentiles. Regressions include industry and year fixed effects. T-stats, based on standard errors robust to heteroskedasticity and firm-level clustering, are in parentheses. *** indicates significance at1%, ** at 5%, and * at 10%.

Panel A: Information effects based on R&D – the level of cash

Dependent variable: Cash / Assets	Analyst Coverage (Decile)
Coverage	0.047***
	(11.14)
Coverage * R&D	0.026***
	(5.31)
R&D	0.014***
	(6.45)
Controls	Same as specification (1), Table 2
Observations	94,636
Adjusted R-squared	0.512

Panel B: Information effects based on R&D – the marginal value of cash

	(1) Low information asymmetry	(2) High information asymmetry	$\beta_H - \beta_L = 0$
ΔC_t	1.239***	1.818***	
	(26.74)	(32.37)	
Coverage	0.038***	0.030***	
	(3.97)	(2.74)	
ΔC_t * Coverage	0.467***	0.922***	4.17**
	(5.34)	(9.54)	p. val =0.04
Controls	Same as specification (1), Table 4		
Observations	42,938	40,345	
Adj. R-squared	0.227	0.258	

Panel C: Monitoring effect based on the G-index – the level of cash

Dependent variable: Cash / Assets	Analyst Coverage (Decile)
Coverage	0.006
	(0.27)
Coverage * G-index	0.005**
	(2.20)
G-index	-0.007***
	(-3.49)
Controls	Same as specification (1), Table 2
Observations	19,966
Adjusted R-squared	0.565

Panel D: Monitoring effect based on the G-index – the marginal value of cash

	(1) Low agency conflict	(2) High agency conflict	$\beta_H - \beta_L = 0$
ΔC_t	2.007***	0.267*	
	(14.97)	(1.78)	
Coverage	0.027	-0.009	
	(1.27)	(-0.42)	
ΔC_t * Coverage	0.494***	1.673***	4.85**
	(2.69)	(8.61)	p.val = 0.03
Controls	Same as specification (1), Table 6		
Observations	11,311	8,645	
Adj. R-squared	0.232	0.198	

Table 6: The accumulation of excess cash and its associated valuation

Panel A presents results of OLS regressions for the relation between analyst coverage and a firms' accumulation of excess cash. Excess cash is the residual based on the average coefficients from the Fama-MacBeth regression using the baseline BKS regression. The dependent variable is the change in the excess cash ratio from year t-1 to t. All variables excluding analyst coverage are deflated by book value of assets. Models 1 and 2 define analyst coverage as the logarithm of the number of analysts plus one and according to deciles, respectively. Panel B presents the regression results of $r_{i,t} - R^B_{i,t}$ on analyst coverage, excess cash, and changes in firm characteristics (Faulkender and Wang (2006)). In Model 1, ExCash is an indicator variable which equals one if a firm's excess cash is above the sample median. Model 2 keeps only firms with positive excess cash at time t. T-stats, based on standard errors robust to heteroskedasticity and firm-level clustering, are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10%.

Panel A: Accumulation of excess cash

Dependent variable: $\Delta ExcessCash_t$	(1) (No. of)	(2) (Deciles)
Coverage_{t-1}	-0.002***	-0.006***
	(-5.06)	(-4.19)
Ind. Average change in excess cash_t	0.841***	0.838***
	(27.63)	(27.57)
Constant	-0.003***	-0.002*
	(-2.88)	(-1.81)
Observations	33,729	33,729
Adjusted R-squared	0.042	0.042

Panel B: The marginal value of cash and excess cash

Dependent variable: $r_{i,t} - R^B_{i,t}$	(1)	(2)
ΔC_t	1.899***	1.930***
	(39.24)	(34.26)
Coverage	0.034***	0.067***
	(3.21)	(4.60)
ExCash	-0.215***	-1.320***
	(-25.27)	(-24.09)
ΔC_t*Coverage	0.726***	0.443***
	(4.88)	(4.15)
ΔC_t*ExCash	-0.181***	-1.705***
	(-3.79)	(-6.83)
ExCash*Coverage	0.046***	0.225**
	(2.98)	(2.38)
ΔC_t*ExCash*Coverage	0.476***	4.897***
	(2.82)	(9.15)
Controls	Same as specification (1), Table 4	
Observations	62,501	41,773
Adjusted R-squared	0.248	0.321

Table 7: Descriptive statistics and comparison of firm characteristics – public vs. private

Panel A presents the number of public and private firms in the sample by year. Panel B presents the mean (median) values for key firm characteristics, also separated by private and public firms. The third column reports the t-stat (z-stat based on Wilcoxon's rank sum test) for the difference in means and medians between the first two columns. Except as noted, all variables are defined as in Table 1. 3-yr. Sales Growth is defined as three-year compound sales growth. ***, **, and * indicate the significance levels of 1%, 5%, and 10%, respectively.

Panel A: Number of public and private firms by year

Year	No. of Public Firms	No. of Private Firms
2003	3549	960
2004	3429	876
2005	3260	815
2006	3094	727
2007	2954	584
2008	2873	480
2009	2818	434

Panel B: Comparison of key firm characteristics -- public vs. private

	Public (A)	Private (B)	Difference t-stat(z-stat) (A)-(B)
Cash	0.210	0.108	30.80***
	(0.129)	(0.045)	38.17***
3-yr. Sales Growth	0.568	0.843	-10.00***
	(0.260)	(0.204)	2.89 ***
Industry Sigma	0.073	0.069	11.49***
	(0.079)	(0.062)	11.07***
Firm Size	6.073	5.219	24.92***
	(6.003)	(5.588)	19.28***
Cash Flow	0.028	0.047	-5.54***
	(0.068)	(0.134)	-37.20***
NWC	0.056	0.020	12.15***
	(0.041)	(0.030)	5.06***
CAPX	0.050	0.049	1.18
	(0.031)	(0.029)	5.10***
Leverage	0.183	0.510	-86.26***
	(0.148)	(0.469)	-55.52***
R&D	0.271	0.204	2.90***
	(0.005)	(0.000)	22.24***
Dividend Dummy	0.340	0.034	44.33***
	(0.000)	(0.000)	42.80***
AQC	0.022	-0.023	47.03***
	(0.000)	(0.000)	65.60***

Table 8: Cash in Public vs. Private Firms

This table presents regression results and the average difference in cash holdings for US public and private companies from 2003–9. A firm must have positive book value of total assets and positive sales to be included in the sample. Financial firms (SIC codes between 6000 and 6999) and utility firms (SIC codes between 4900 and 4999) are excluded. Except as noted, variables are defined as in Table 1. Panel A presents regression estimates for the public and private firms' sample. Firms that go public or private are not included in the sample. 3-yr. Sales Growth is defined as three-year compound sales growth. The private firm dummy equals one when a company's status is private. The public dummy equals one if public firms have no analyst coverage. Panel B presents the average difference in cash holdings of public and private firms. Cash holdings are cash plus marketable securities to the book value of assets (#1 / #6). To evaluate the difference in cash holdings, we apply the propensity score method to control for various firm characteristics using a probit model. Log(sales) is defined as the logarithm of sales plus one (#12). Term premium is the difference of yield spreads between 10-year and 1-year treasury bonds at the fiscal year end. Default premium is the difference of yield spreads between BBB and AAA corporate bonds at the fiscal year end. Standard errors are in parentheses, calculated by bootstrapping with 50 replications. T-stats, based on standard errors robust to heteroskedasticity and firm-level clustering, are in parentheses. *** indicates significance at 1%, ** at 5%, and * at 10%.

Panel A: Private/Public status and the level of cash holdings

Dependent variable: Cash / Assets	(1) Exclude zero coverage Public firms	(2) Include zero coverage Public firms
Private Firm Dummy	-0.079***	-0.066***
	(-15.42)	(-13.18)
Public (zero coverage) Dummy		-0.042***
		(-8.30)
3-yr. Sales Growth	0.004***	0.004***
	(3.72)	(3.66)
Industry Sigma	0.549***	0.530***
	(4.81)	(4.75)
Firm Size	-0.019***	-0.017***
	(-17.21)	(-16.68)
Cash Flow	0.025**	0.002
	(2.15)	(0.19)
NWC	-0.281***	-0.281***
	(-20.62)	(-22.80)
CAPX	-0.391***	-0.404***
	(-13.52)	(-14.77)
Leverage	-0.182***	-0.214***
	(-22.69)	(-26.61)
R&D	0.026***	0.025***
	(13.16)	(14.93)
Dividend Dummy	-0.038***	-0.027***
	(-8.89)	(-6.81)
AQC	-0.270***	-0.271***
	(-15.48)	(-16.54)
Observations	21,994	26,853
Adjusted R-squared	0.524	0.493
Year FE	Yes	Yes
Industry FE	Yes	Yes

Panel B: Differences in cash holdings based on propensity score matching

Estimator	Including all public and private firms Difference in cash holdings (standard error)	Including only public firms with zero coverage and private firms Difference in cash holdings (standard error)
One-to-one	-0.084***	-0.020***
	(0.010)	(0.001)
Nearest neighbor (n=10)	-0.077***	-0.022***
	(0.008)	(0.007)
Nearest neighbor (n=25)	-0.077***	-0.027***
	(0.007)	(0.007)
Nearest neighbor (n=50)	-0.066***	-0.026***
	(0.006)	(0.007)
Gaussian	-0.074***	-0.027***
	(0.007)	(0.006)
Epanechnikov	-0.081***	-0.023***
	(0.007)	(0.008)

$$Private\ firm_{i,t} = \beta_0 + \beta_1 \log(sales)_{i,t} + \beta_2 R\&D_{i,t} + \beta_3 CAPX_{i,t} + \beta_4 Dividend\ dummy_{i,t} + \beta_5 3\text{-}yr\ sales\ growth_{i,t} + \beta_6 Cas\ flow_{i,t} + \beta_7 Leverage_{i,t} + \beta_8 AQC_{i,t} + \beta_9 term\ premium_t + \beta_{10} Default\ premium_t + \textit{Industry fixed effects} + \varepsilon_{i,t}$$