Disclosure and Monitoring: The Effects of Management Earnings Forecasts on the Pay-Performance Relation

Gus De Franco
Rotman School of Management
University of Toronto
gus.defranco@rotman.utoronto.ca

Ole-Kristian Hope
Rotman School of Management
University of Toronto
okhope@rotman.utoronto.ca

Stephannie Larocque
Rotman School of Management
University of Toronto
s.larocque03@rotman.utoronto.ca

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Abstract

We examine whether improved disclosure leads to better monitoring of management. We posit that better disclosures improve shareholders' ability to relate managerial decisions to firm performance. We use management earnings forecasts as our empirical proxy for disclosure and document the following. First, we predict and find higher sensitivity of CEO compensation to performance (both accounting and stock returns). Second, in a sub-sample of firms that issue management earnings forecasts, we predict and find that the sensitivity of CEO compensation to performance is increasing in the number of forecasts that firms issue during the year and in the number of consecutive years that firms have issued management forecasts (i.e., the pay-performance relation is increasing in the degree of disclosure). The results are robust to Heckman self-selection tests, matched-sample tests, and controls for the information environment, noise in our performance variables, the asymmetric sensitivity of cash compensation to returns, and variations in investment opportunities.

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1. Introduction

In this paper we empirically examine whether improved transparency leads to better monitoring of management. By monitoring, we mean evaluating and rewarding management. In particular, we study the effect of management earnings forecasts (MEFs hereafter) on the CEO pay-performance relation.[1] Our research question is important because improved monitoring represents a potential benefit of discretionary disclosure not well studied.

The theoretical intuition for our prediction follows that of agency theory. When it is not feasible for the principal to fully observe the agent's actions, which in practice is almost always the case, agency theory predicts that the principal will use imperfect observable performance information to mitigate moral hazard problems (Holmström 1979). A key premise underlying agency theory is that the principal knows the relation between the observable performance information and the agent's actions. In practice, the actual relation between firm performance and the multiple dimensions of CEO's action is complex and must be estimated. We posit that improved disclosure allows stakeholders (e.g., boards and investors) to more easily observe and estimate the relation between the manager's actions and performance, hence reducing noise in the relation. Furthermore, improved transparency could allow stakeholders to more easily filter out the noise caused by factors unrelated to managements' actions on performance, consistent with the "noise reduction" role of information (see, e.g., Banker and Datar 1989; Lambert 2001). Thus we predict that the pay-performance relation will be stronger for firms that provide management earnings forecasts, our empirical proxy for higher disclosure. Our prediction is

[1] Management earnings forecasts have also been referred to as management guidance; we use both the abbreviation MEFs and the word guidance in the paper.

indirectly supported by theoretical studies. For example, Hermalin and Weisbach (2007) assume that the quality of public disclosure impacts the board of directors' ability to monitor management (see, also Hermalin 1993; Mueller and Inderst 2007).

The analysis in this study supports our prediction. We find the following. First, in a regression of CEO compensation (salary plus bonus) on accounting and stock price performance, we document that the coefficients on both performance measures are higher for firms issuing a quantitative management earnings forecast. Our results suggest that this difference is economically meaningful. Second, in a sub-sample of firms that issue management earnings forecasts, we further find that the pay-performance relation is stronger in the "degree" of disclosure. Specifically, the sensitivity of compensation to performance is increasing in the number of forecasts that firms issue during the year and in the number of consecutive years that firms have issued management forecasts.

Management earnings forecasts are a voluntary disclosure and hence it is possible that the decision to disclose is related to the compensation decision. We address the endogeneity of management forecast issuance in two ways. First, we use a Heckman self-selection model, where the first stage predicts whether a MEF was issued and the second stage estimates the pay-performance relation. Second, we use a matched-sample approach. Our results are robust to both of these tests.

We also investigate alternative explanations for our results. First, we consider whether our results are attributable to a generally better information environment for firms that issue MEF, as proxied by firm size and analyst coverage. Second, we consider whether differential noise in our performance variables can explain our results. We proxy for noise by the variance in prior accounting and stock market performance. Third, we examine the effect of modeling asymmetric sensitivity to returns (Leone, Wu, and Zimmerman 2006). Fourth, we control for other variables related to firms' investment opportunities that could affect the pay-performance relation, such as the book-to-market ratio, firm age, and leverage. Our results are robust to these alternative explanations.

Our analysis contributes to the literature that examines how agency problems can be mitigated through increased transparency (see Healy and Palepu 2001; Ball 2006). Several empirical studies relate better disclosure to better firm performance (e.g., Biddle and Hilary 2006; Hope and Thomas 2007). These papers implicitly assume that disclosure leads to better monitoring, which in turn leads to better performance. By focusing on the pay-performance relation, we establish a more direct link between disclosure and monitoring.

We also contribute to the limited literature on disclosure and corporate governance. Nagar, Nanda, and Wysocki (2003) show that firm disclosures are increasing in stock price-based incentives, namely the proportion of CEO compensation affected by stock price and the value of shares held by the CEO. Ajinkya, Bhojraj, and Sengupta (2005) and Karamanou and Vafeas (2005) study the relation between corporate governance and disclosure. They each show that MEF issuance is increasing in board characteristics associated with effective corporate governance. While this research focuses on the incentives or the determinants to disclose, our paper is about the effects of disclosure (although in sensitivity analyses we control for incentives to disclose).

In addition, our study informs the current debate about the role of MEF issuance. Critics, including a commission set up by the U.S. Chamber of Commerce (2007), the CFA Institute (Krehmeyer, Orsagh, and Schacht 2006), and the Aspen Institute (2007), have called for an end to management earnings forecasts. They purport that such guidance creates incentives for firms to manage earnings upwards, distort earnings, or act myopically. Whether managers do so is an open question and the empirical evidence is mixed. Cheng, Subramanyam, and Zhang (2005) find that "dedicated guiders" invest less in R&D than do occasional guiders. In contrast, Houston, Lev, and Tucker (2007) find that "guidance stoppers" do not increase capital investments and R&D after stopping guidance. We are *agnostic* about the costs of management guidance, and we do not suggest an equilibrium amount of MEF issuance. We simply point out that improved monitoring of CEOs represents a potential benefit that should be considered in any analyses of management guidance.

Further, some critics specifically target quarterly earnings forecasts or suggest moving away from quarterly to annual guidance. We test for but find no difference in the pay-performance relation between firms that issue only quarterly or only annual MEFs. These results provide no support that this distinction is important, at least with respect to monitoring of management.

The remainder of our paper is organized as follows. Section 2 contains our literature review and develops our research question. In Section 3 we discuss the sample and present our primary tests and results. In Section 4 we address potential self-selection issues. In Section 5 we consider alternative explanations. Section 6 distinguishes firms that issue quarterly from those that issue annual forecasts. Section 7 concludes.

2. Literature Review and Hypothesis Development

2.1. Voluntary disclosure and management earnings forecasts

The extant literature is rich with findings on the costs and benefits of increased disclosure. Firms disclose more when information asymmetry is high (e.g., Glosten and Milgrom 1985; Diamond and Verrecchia 1991; Kim and Verrecchia 1994), when the threat of competitor entry is low (e.g., Darrough and Stoughton 1990; Clarkson, Kao, and Richardson 1994), and when the risk of litigation related to the release of bad news is high (e.g., Skinner 1994; Francis, Philbrick, and Schipper 1994; Brown, Hillegeist, and Lo 2006). Ceteris paribus, firms should enjoy improved liquidity (e.g., Welker 1995; Healy, Hutton, and Palepu 1999; Leuz and Verrecchia 2000), increased analyst following (e.g., Lang and Lundholm 1996; Healy, Hutton, and Palepu 1999), and reduced cost of capital (e.g., Diamond and Verrecchia 1991; Baiman and Verrecchia 1996; Botosan 1997; Easley, Hvidkjaer, and O'Hara 2002) as a result of their discretionary disclosures.

Our paper focuses on management earnings forecasts (MEFs), which are voluntary managerial disclosures that provide information about firms' expected earnings. According to Hirst, Koonce, and Venkataraman (2006), MEFs represent a key disclosure mechanism by which to establish or alter the market's earnings expectations, preempt litigation concerns, and potentially influence managers' reputations for transparent and accurate reporting. Research shows that firms issue MEFs to align the market's expectations with their own earnings assessments (King, Pownall, and Waymire 1990; Ajinkya and Gift 1984). In other words, managers use MEFs to mitigate information asymmetry between investors and managers as suggested by theory (see, e.g., Dye 2001; Verrecchia 2001). Consistent with this assertion, Coller and Yohn (1997) document that MEFs reduce information asymmetry measured as bid-ask spreads (see also Marquardt and Wiedman 1998). Recent survey evidence by Graham, Harvey, and Rajgopal (2005) further suggests that managers voluntarily disclose information (such as management earnings forecasts) to facilitate "clarity and understanding" by investors.

Prior research concludes that the credibility of management forecasts compares with that of audited financial information. For example, Pownall and Waymire (1989) find that the market reaction to unexpected MEFs is similar in magnitude to the reaction to unexpected earnings announcements. Pownall, Wasley, and Waymire (1993) document that MEFs affect stock prices, and in particular that such forecasts remain informative even after controlling for other disclosure types. Consistent with the view that MEFs provide credible new information, tests of the accuracy of these forecasts indicate that they are more accurate than contemporaneous analysts' forecasts (Houston et al., 2007; Hassell and Jennings, 1986; Waymire, 1986). Hassel, Jennings, and Lasser (1988) further find that MEFs have a positive effect on financial analysts' forecast accuracy. Finally, Li and McConomy (2004) find that the provisions of MEFs are credible (i.e., value relevant) signals for their sample of IPO firms.

Consistent with the strong capital market effects of MEFs as discussed above, we use the occurrence of MEFs as a proxy for increased disclosure. As further support for the use of MEFs this way, the literature shows that MEFs are often supplemented with additional disclosures (Waymire 1984; Hoskin, Hughes, and Ricks 1986; Han and Wild 1991; Baginski, Hassell, and Hillison 2000; Hutton, Miller, and Skinner 2003; Baginski, Hassell, and Kimbrough 2004).[2]

2.2. The role of disclosure in monitoring managers

Prior research argues that financial disclosures are an important means of monitoring managers to make them more accountable.[3] Such monitoring is potentially valuable since managers will not always act in the best interest of shareholders (Jensen and Meckling 1976). Healy and Palepu (2001) discuss how disclosures can reduce agency costs by providing shareholders with an effective monitoring tool. Specifically, better disclosures improve

[2] As some specific examples, Hutton, Miller, and Skinner (2003) show that MEFs are accompanied by other disclosures, such as verifiable forward-looking statements and qualitative discussions, about two thirds of the time. Baginski, Hassell, and Kimbrough (2004) find that about three quarters of MEFs include a discussion and explanation for the forecasted performance.

[3] Bushman and Smith (2001), Healy and Palepu (2001), and Watts and Zimmerman (1986) provide overviews of this literature

shareholders' ability to relate managerial decisions to firm performance (Lombardo and Pagano 2002; Hope and Thomas 2007). Similarly, Ball (2006) argues that increased transparency causes managers to act more in the interests of shareholders. Well-cited theoretical works on the monitoring role of disclosures include Stiglitz (1975), Holmström (1979), Gjesdal (1981), Diamond and Verrecchia (1991), and Kanodia and Lee (1998). Empirical studies that provide examples of how firm disclosure can be used by outsiders to monitor the activities of managers include Bens and Monahan (2004), Biddle and Hilary (2006), and Hope and Thomas (2007).[4]

The theoretical intuition for our hypothesis follows that of agency theory. When it is prohibitively costly or not possible for the principal to fully observe the agent's actions, imperfect information is used to alleviate the moral hazard problem (see, e.g., Holmström 1979). An important underlying assumption in agency theory is that the observable performance metric is positively related to the unobservable CEO effort. Performance is usually modeled as a positive linear function of effort plus "noise," where noise includes all factors that affect performance that are unrelated to the CEO's effort. The standard prediction is that the principal will set pay to be a positive linear function of observed performance. The strength of this pay-performance relation (PPR hereafter) depends on the relation between effort and performance. PPR is predicted to increase in the strength of, and decrease in the noise in, the relation between effort and the performance (e.g., Banker and Datar 1989). Another way to explain this agency theory prediction is that if the principal can more confidently estimate the agent's unobservable

[4] Bens and Monahan (2004) document a significantly positive association between disclosure level and a measure of the excess value of diversification. They attribute this result to the monitoring effect of disclosure, concluding that greater firm disclosure reduces management's proclivity for investing in assets that destroy shareholder value. Biddle and Hilary (2006) find a positive association between financial reporting quality and investment efficiency. Consistent with the monitoring role of financial disclosures, Hope and Thomas (2007) find that managers of firms that no longer disclose geographic earnings following SFAS 131 are more likely to engage in foreign empire building. Specifically, they find that non-disclosing firms, relative to firms that continue to disclose geographic earnings, experience greater expansion of foreign sales and long-lived assets, produce lower foreign profit margins, and have lower firm value.

effort given the observable performance signal, then the principal will tie pay more strongly to performance.

A case in point is CEO compensation. It is particularly difficult for the board of directors to fully observe the CEO's actions. In practice, CEOs' compensation contracts are incentive-based, with the purpose of aligning top managements' incentives with the firms' shareholders (Smith and Watts 1982). A large literature has ensued on the observed relation between CEO compensation and performance, with earnings (usually return on assets (ROA)) and stock returns used as the primary measures of performance (e.g., Lambert and Larcker 1997; Bushman and Smith 2001). The literature generally finds empirical evidence in support of agency theory predictions when cash compensation (i.e., CEO salary plus bonus) is used but not when total compensation (i.e., CEO salary plus bonus plus changes in the CEO's equity portfolio value) is used to measure compensation (see, e.g., Core, Guay, and Verrecchia 2003).

We posit that better disclosure leads to improved monitoring as evidenced by a stronger observed PPR for firms that issue MEFs. The mechanism underlying our prediction could work in two general ways as follows. First, in theoretical models it is typically assumed that the principal knows the specific function between the agent's effort and the firm's performance and that the agent's actions are limited to one dimension (i.e., effort). In practice, the actual function between performance and the multiple dimensions of CEO's actions (e.g., effort, optimal investments, hiring, firing, motivating subordinates, communicating with diverse groups of stakeholders, etc.), is complex, and unlikely to be known with certainty. The error between the expected function and the true function represents a source of additional noise in the relation between the CEO's actions and the firm's performance. Improved disclosure, and the resulting increased transparency, allows the compensation committee to more easily observe and estimate the relation between managers' actions and performance, which reduces the noise. Second, improved transparency could allow boards to more easily filter out the noise caused by factors unrelated to managements' actions on performance. For example, Banker and Datar (1989) show that a performance measure that is *unrelated* to the CEO's actions can be useful in determining the agent's compensation if it is correlated with the noise in the PPR. Lambert (2001) refers to this idea as the "noise reduction" role of information.[5]

Consistent with both these mechanisms, Baginski et al. (2004) show MEFs are accompanied by disclosures that link the forecasted performance with both internal management actions and external issues. New products, prices, strategies, and capital investments are examples of managements' actions and input prices, legal actions, and currency exchange rates, are examples of external issues. Baginski et al. (2004) argue that these attributions potentially aid investors by confirming known relations between attributions and performance (as measured by profitability) or identifying additional causes of performance. We expect that MEFs combined with these attributions assist stakeholders in determining the effectiveness of CEO actions.

Our prediction is also supported by other theoretical studies. Hermalin and Weisbach (2007) argue that the quality of public disclosure impacts the board of directors' ability to monitor management. In particular, they contend that the benefits of disclosure reflect the fact that more accurate information about performance allows boards to make better personnel decisions about their executives (see also Mueller and Inderst, 2007). Both Hermalin and Weisbach (2007) and Hermalin (1993) posit that better information leads to stronger inferences about the CEO's effectiveness from the observable performance signal. It follows that with better information, when evaluating the CEO, more weight is placed on the performance signal.

[5] This idea also underpins theoretical work on relative performance evaluation, where information about a peer company's performance is used to help evaluate the CEO's performance (see Lambert 2001).

Given the above discussion, we predict that, ceteris paribus, the pay-performance relation is stronger for firms that provide MEFs, our empirical proxy for improved disclosure. We offer three comments about our prediction.

First, if optimal contracting perfectly describes the compensation-setting process, then the board sets pay optimally. If so, our assumption that the compensation committee relies on public voluntary disclosures in their compensation decision may not be fully descriptive, which serves to weaken the power of our tests. However, a large literature examines the effectiveness of boards, and finds that boards are not always effective. For example, studies by Bebchuk and Fried (2003; 2004; 2005) indicate that the pay-setting process has strayed far from the arm's-length model assumed in most economic models of pay arrangements. In particular, they find that managerial power leads to compensation schemes that weaken managers' incentives to increase firm value and that may even create incentives for managers to take actions that *reduce* long-term firm value (see also, e.g., Jiraporn, Kim, and Davidson 2005). With increased public transparency, for the same reasons mentioned above, external stakeholders, such as institutional investors, analysts, and the media, can also better monitor managers. In a setting where compensation is not always optimal, these external stakeholders can explicitly or implicitly pressure the board to tie compensation more strongly to performance.

Second, we do not expect that CEO decisions to publicly disclose earnings forecasts are explicitly included in their compensation contract. CEOs exercise discretion in issuing MEFs, so forecasts are not ideal dimensions to formally contract on. We posit that a consequence of increased disclosure, regardless of its motivation, is that CEOs will be evaluated based on that disclosure ex post. This setting suggests discretion and subjectivity in the compensation process, which is consistent with the findings by Bushman, Indjejikian, and Smith (1996). Using proprietary compensation data, they show the existence and study the determinants of "individual performance evaluation," which is an assortment of performance measures including subjective evaluations of individual performance.

Third, if the pay-performance relation is stronger in MEF firms, it is conceivable that CEOs engage in earnings or expectations management. This is essentially the institutional critique of MEFs.[6] However, if there is significant earnings bias or distortion and boards rationally anticipate it, then this effect will work against us finding a stronger pay-performance relation in MEF firms. In an extreme case, if management guidance leads to significant earnings management, then the board would rationally place no weight on managements' forecasts, and hence we would find no results.

3. Tests and Results

In this section, we present the primary tests of our prediction that the pay-performance relation is stronger for firms that provide MEFs.

3.1. Empirical model

Our empirical model follows that used in the extant compensation literature. In particular, Lambert and Larcker (1987) and Core (2002) suggest the following specification for tests of the pay-performance relation:

$$Pay_t = \mathrm{E}_{t-1}[Pay_t] + \beta\ Unexpected\ Performance_t + \varepsilon_t. \quad (1)$$

Including expected pay controls for a variety of factors that could affect compensation, such as firm size, CEO age, and corporate governance. Using last year's pay as the expectation about this year's pay, and placing it on the left-hand side, leads to:

[6] Critics also tend to emphasize the idea that managers will focus on maximizing the near-term at the expense of longer-term value-enhancing investments.

$$Pay_t - Pay_{t\text{-}1} = \gamma_0 + \beta \; Unexpected\ Performance_t + \varepsilon_t. \quad (2)$$

The coefficient β represents the pay-performance relation which we expect to be positive. From our hypothesis, we expect β to be greater for firms that are more transparent (i.e., issue management forecasts). To test this notion we estimate separate coefficients for firms that issue management forecasts and firms that do not by interacting a management forecast indicator variable (*MFd*) with *Unexpected Performance*.

$$\begin{aligned} Pay_t - Pay_{t\text{-}1} = \gamma_0 &+ \beta_1 \; Unexpected\ Performance_t \\ &+ \beta_2 \; Unexpected\ Performance_t \times MFd_t + \beta_3 \; MFd_t + \varepsilon_t. \end{aligned} \quad (3)$$

Specifically, we run various specifications of the following regression test using the full sample of firms (both firms that issue MEFs and those that do not):[7]

$$\begin{aligned} \Delta ln(Comp)_{it} = a_0 &+ a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \; Ret_{it} + a_4 \; Ret_{it} \times MFd_{it} \\ &+ a_5 \; MFd_{it} + \varepsilon_{it}. \end{aligned} \quad (4)$$

Comp is the CEO's cash compensation, measured as the sum of salary and bonus. The symbol Δ refers to the change in the variable from last year and *ln( )* is the natural logarithm of the variable. *ROA* is net income before extraordinary items scaled by lagged total assets. *Ret* is the one-year return to shareholders during the fiscal year from CRSP. *MFd* equals one for firms that issue a quantitative management earnings forecast (either quarterly or annual), and zero otherwise. The subscripts *i* and *t* denote the firm and fiscal year, respectively. All variables are defined in the Appendix.[8]

While much of the literature focuses on whether accounting or stock performance is the better performance metric, researchers including Sloan (1993) find that both stock-priced-based incentives and accounting-earnings-based incentives determine top executive compensation (see

[7] Our empirical specification is similar to that of Davila and Penalva (2006) who test for the effects of governance on the relation between compensation, ROA, and stock returns. Where we use an "*MFd*" indicator variable, they use a summary measure of corporate governance.

[8] In untabulated sensitivity analysis, similar results obtain when we use market-adjusted returns, or when we include industry effects in the model

also Lambert and Larcker 1987; Core et al. 2003). We are agnostic about this issue and use both in our tests. We present results for regressions using each performance measure separately as well as results with both performance measures included jointly.

Equation (4) tests whether the CEO pay-performance relation is increasing in the *existence* of management disclosure. We next examine whether the pay-performance relation is increasing in the *degree* of disclosure. Following Ajinkya et al. (2005), our first proxy for the degree of disclosure is the frequency of forecasts issued in a given year. All else equal, we expect that more disclosures lead to higher levels of transparency. Our second proxy captures whether firms' "commitment" to disclose matters. For example, following theoretical work by Diamond and Verrecchia (1991) and Baiman and Verrecchia (1996), Leuz and Verrecchia (2000) emphasize the commitment by a firm to increase disclosure. Indeed, only a fraction of the firms issuing MEFs in our sample consistently issue guidance. This leads one to question to what extent the issuance of MEFs can be useful in monitoring managers, when it is somewhat sporadic. While it is not possible to ex ante commit to management forecasts, we use the number of consecutive years with a forecast as a proxy for an implicit commitment to disclose.

To test whether the degree of disclosure matters, we estimate the following two equations within the sample of management forecasting firms:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times ln(Frequency)_{it} + a_3\, Ret_{it} + a_4\, Ret_{it} \times ln(Frequency)_{it} + a_5\, ln(Frequency)_{it} + \varepsilon_{it}. \quad (5)$$

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times ln(Consistency)_{it} + a_3\, Ret_{it} + a_4\, Ret_{it} \times ln(Consistency)_{it} + a_5\, ln(Consistency)_{it} + \varepsilon_{it}. \quad (6)$$

Frequency is the number of MEFs issued by the firm. *Consistency* is the number of consecutive years in which the firm has provided a forecast, including the current year.

When estimating equations (4) to (6), following Core, Guay, and Verrecchia (2003), we also include year effects. In addition, because the estimations of these equations are likely to suffer from time-series dependence, we estimate the model as a panel and cluster the standard errors at the firm level (in addition to the year fixed effects).[9] Significance levels are based on one-tailed tests where there is a prediction of the coefficient's sign and based on two-tailed tests otherwise.

3.2. Sample

Our sample is based on the intersection of the Compustat Executive Compensation (ExecuComp), Compustat Annual Industrial, CRSP, and First Call Analyst databases for 1997 through 2005. Table 1, Panel A describes our sample selection procedure. From ExecuComp we require non-missing cash compensation data for the CEO. We also require that the CEO hold that position for all or most of the indicated fiscal year. From Compustat, we require annual earnings before extraordinary items and total assets. We obtain return data from CRSP. Like Feng and Koch (2006), we limit the sample to firms on the First Call Analyst database because the First Call Company Issued Guidelines ("CIG") database provides the best coverage of MEFs for the firms that are also covered by First Call sell-side analysts (see Anilowski, Feng, and Skinner, 2007). If First Call covers the firm as evidenced by their collection of the firm's analyst forecasts but reports no MEF for the firm, then it is highly likely that the firm truly did not issue a forecast. This reduces the potential error associated with mis-classifying firms not included in the CIG database as non disclosers. For example, a firm could actually issue a MEF but First Call does not cover it. As well, to the extent that First Call chooses which firms to cover, this potential

[9] We also estimate annual regressions and calculate mean coefficients and standard errors based on the annual coefficients, as in Fama and MacBeth (1973), for all the regressions in the paper. Untabulated results from these estimations are all similar to our tabulated results.

selection bias will not affect our inferences because all the firms in our sample were selected by First Call for coverage.

Merging these three databases yields a total of 10,106 firm-year observations for the years 1998-2005. To reduce the effects of extreme observations, we delete firm-year observations in the top and bottom one percent of the distribution for *Δln(Comp)*, *ΔROA*, and *RET*. This results in a sample size of 9,575 firm-year observations for the years 1998-2005. The number of unique firms in our sample is 1,959.

Panel B of Table 1 shows the distribution of our sample by year and by whether the firm issued a forecast that year. For 6,173 firm years, firms issue an MEF and for 3,402 firm years, firms do not. The total number of observations per year is similar across time. The actual number of firms issuing a management forecast is highest immediately following passage of Reg FD, which was introduced in October 2000. Reg FD prohibits the selective disclosure of information by firms. Heflin, Subramanyam, and Zhang (2003) and Bailey et al. (2003) find an increase in MEF issuance following Reg FD. After peaking in the years 2001 and 2002, the number of firms issuing MEFs decreases modestly.

3.3. Descriptive statistics

Table 2 reports descriptive statistics about the variables used in our analysis for the sub-samples of 6,173 MEF and 3,402 non-MEF firm years. All differences between the MEF and non-MEF groups are statistically significant at the 5% (two-sided) level for both parametric (*t*-test) and non-parametric (Wilcoxon) tests, with the exceptions of *Loss*, *var(ΔROA)*, *var(RET)*, *Leverage,* and *FirmAge*.

Significant differences between the issuing and non-issuing MEF sub-samples include *RET*, *ΔROA*, *Comp*, and *ΔlnComp*. Stock returns average 10% for the MEF sample and 18% for the non-MEF sample, while the mean change in ROA is -0.009 for the MEF sample and 0.002 for the non-MEF sample. In addition, cash compensation is higher for firms that issue MEFs (mean of $1.585 million vs. $1.426 million for non-issuing firms), while the increase in cash compensation is greater for non-issuing firms. The mean (median) age of our sample firms is 24 (18) years and similar to that reported by Leone et al. (2006), while the mean (median) market value for our sample is $7.621 ($1.598) million. Mean (median) total cash compensation in thousands is $1,528 ($1,085) and is somewhat higher than reported by Leone et al. (2006) for an earlier (1993-2003) sample period.

Table 3 reports correlations among the variables used in the multivariate tests. Spearman (Pearson) correlations are reported above (below) the diagonal. Pearson correlations indicate that both the performance measures are significantly positively correlated with Δ*ln(Comp)*, and at levels consistent with Leone et al. (2006).

3.4. Results

Table 4 provides the results of estimating equation (4). Columns (1) to (3) present the results for the benchmark model in which we include the performance variables but not the management disclosure variables. The coefficients on Δ*ROA* and *Ret* are positive and statistically significant. For example, in column (3) when both performance variables are included in the model, the Δ*ROA* coefficient is 1.023 (*t*-statistic = 15.12) and the *Ret* coefficient is 0.187 (*t*-statistic = 20.35). The adjusted R^2 is 0.1361. Columns (4) to (6) present the results with the management forecast indicator variable. We find a significantly positive coefficient when *MFd* is interacted with each of Δ*ROA* and *Ret*. For example, in column (6), the respective coefficients are 0.357 and 0.077, both significant at the 1% level. In other words, the pay-performance relation is strengthened in the presence of management guidance. In terms of economic significance, using the column (6) results, the non-guidance firms have a Δ*ROA* coefficient of 0.770, while guidance firms have an incremental Δ*ROA* coefficient of 0.357. This implies that MEF firms' compensation-accounting performance sensitivity is approximately 46% (i.e., 0.357/0.770) higher than for non-MEF firms. A similar calculation shows that the compensation-return performance sensitivity is approximately 55% higher for guidance firms.

Our tests for whether the degree of disclosure matters are presented in Table 5. The number of observations is smaller because we restrict this analysis to only firms with MEFs. Columns (1) to (3) present the results of including management forecast frequency in the model. The coefficients on *Frequency* interacted with each of Δ*ROA* and *Ret* are positive and statistically significant at the 1% level. The results of including the number of consecutive forecast years are presented in columns (4) to (6). The coefficients on *Consistency* interacted with each of Δ*ROA*, and *Ret* are also positive, albeit at lower levels of statistical significance. In column (4), when *Consistency* is interacted with only Δ*ROA*, the coefficient is significant at the 5% level. In column (5) the coefficient on the interaction of *Consistency* and *Ret* is significant at the 1% level. However, when both performance measures are interacted with *Consistency*, the Δ*ROA* interaction is no longer statistically significant, and the *Ret* interaction is significant at the 5% level. These results imply that the pay-performance relation is increasing in management forecast frequency and modestly increasing in the number of consecutive forecasting years. More importantly, overall, these results provide support for the idea that the pay-performance relation is increasing in the degree of disclosure.

4. Additional Analyses to Address Self-Selection Issues

Because MEF issuance is voluntary, our above tests are subject to endogeneity. In other words, it is possible that the decision to disclose is related to the compensation decision. We address the endogeneity of management forecast issuance in two ways. First, we use a Heckman self-selection model. Second, we use a matched-sample design. We discuss each approach in turn.

4.1. Heckman self-selection model

We follow Heckman (1979) and model the decision to disclose in a first-stage equation. Our first-stage model follows Ajinkya, Bhojraj, and Sengupta (2005) (their equation (1)):

$$MFd_{it} = a_0 + a_1\, ln(MV)_{it} + a_2\, Institution_{it} + a_3\, ln(Coverage)_{it} + a_4\, Litigate_{it} + a_5\, Book\text{-}Market_{it} + a_6\, Loss_{it} + a_7\, News_{it} + a_8\, Beta_{it} + a_9\, FD_t + \varepsilon_t. \quad (7)$$

MV is the firm's equity market value measured at the beginning of the year. *Institution* is the percentage of the firm's common equity held by institutional investors (data from Thomson Financial). *Coverage* is the number of First Call analysts that issue earnings forecasts for the firm during the fiscal year. *Litigate* is an indicator variable that equals one for all firms in the biotechnology, computers, electronics, and retail industries, and equals zero otherwise, as in Ajinkya et al. (2005). *Book-Market* is the ratio of book value to market value of equity for the firm. *Loss* is an indicator variable that equals one if the firm reported losses in the current period, and equals zero otherwise. *News* is an indicator variable that equals one if current EPS is greater than previous-period EPS, and equals zero otherwise. *Beta* is the equity beta for the fiscal period, calculated in yearly regressions of daily firm returns on daily market-wide (S&P 500) returns. *FD* is an indicator variable that equals one for years 2000 and beyond, and equals zero otherwise. Note that requiring data to calculate these explanatory variables reduces the size of our sample to 8,575 observations. In the second stage, we estimate our equation (4) model augmented with the Inverse Mills ratio (*InvMills*) from the first-stage model. More specifically, we estimate:

$$\Delta ln(Comp)_{it} = a_0 + a_1\, \Delta ROA_{it} + a_2\, \Delta ROA_{it} \times MFd_{it} + a_3\, \Delta ROA_{it} \times InvMills_{it} + a_4\, Ret_{it} + a_5\, Ret_{it} \times MFd_{it} + a_6\, Ret_{it} \times InvMills_{it} + a_7\, MFd_{it} + a_8\, InvMills_{it} + \varepsilon_{it}. \quad (8)$$

Table 6, Panel A presents the results of estimating equation (7). All the coefficients on the explanatory variables are statistically significant in the expected direction. The exceptions are the coefficients on *ln(MV)* and on *Loss*; in both cases we obtain insignificant coefficient values whereas Ajinkya et al. (2005) report a positive and significant coefficient on *ln(MV)* and a negative and significant coefficient on *Loss* in their specification. Panel B, columns (1) to (3) present the results of estimating equation (8). The coefficients on the Inverse Mills ratio by itself, and interacted with the performance variables are generally statistically significant consistent with self-selection affecting the change in compensation and the pay-performance relation.[10] The coefficients on *MFd* interacted with performance remain positive and statistically significant, although the coefficient magnitudes and statistical significance is reduced somewhat compared to the Table 4 results.[11]

4.2. Matched sample

We also employ a matched-sample design. Heckman, Ichimura, and Todd (1997; 1998) provide theoretical support for matching as an econometric technique for addressing endogeneity. We match disclosers and non-disclosers from our full sample based on time period, industry membership, size, and analyst following. More specifically, for each disclosing firm, we match it with a non-disclosing firm in the same year, the same Fama and French (1997) industry, and the same industry size quartile (with size quartiles formed by sorting all firms in the same Fama-French industry). When more than one non-disclosing firm meets the above criteria, we choose the non-disclosing firm that has analyst following closest to the number of analysts

[10] Inferences are unaffected if we do not interact the Inverse Mills ratio with the performance variables.

[11] We also check for the effect of self-selection on our degree-of-disclosure tests. We create indicator variables for high-frequency and high-consistency forecasts based on a median cutoff. We estimate a first-stage model that predicts whether firms are high or low frequency or consecutive forecasting firms using the same explanatory variables included in equation (7), and using the sub sample of forecasting firms. We then re-estimate equations (5) and (6), including the respective Inverse Mills ratios. All our inferences remain the same.

following the disclosing firm. Thus, we attempt to include firms that have similar incentives to issue MEFs. These matching criteria further limit the size of our sample. The matched sample consists of 1,709 matched firm-year pairs of disclosers and non-disclosers, or 3,418 firm-year observations. Note that each non-disclosing firm-year observation is uniquely matched to one disclosing firm. Table 7 presents the results of estimating equation (4) for the matched sample. The coefficients on *MFd* interacted with the performance measures are positive and statistically significant, corroborating those of the Table 4 full-sample tests above. The other coefficients of these regression also have signs and magnitudes consistent with the above results.

In sum, our results are robust to controls for self-selection, using both a Heckman self-selection model and a matched-pair design.

5. Alternative Explanations

This section investigates alternative explanations for our result that CEO cash compensation is more sensitive to performance for firms that issue MEFs. Before proceeding, we highlight that our compensation variable is already measured in changes. In effect, each firm uses itself as a benchmark and, hence, implicitly controls for unknown, potentially-correlated firm-specific factors that do not change over time. We discuss each of four alternative explanations in turn.

5.1. Information environment

In this section, we consider whether our results can be explained by MEF firms simply having a better information environment. More information from a wide variety of sources, not necessarily from voluntary firm disclosures, could also lead to higher transparency, and hence a stronger pay-performance relation. We use firm size and analyst coverage as proxies for the information environment. Schaefer (1998) finds that the pay-performance relation is inversely related to firm size. Brennan and Subramanyam (1995) posit and document that higher analyst coverage leads to reductions in information asymmetry as proxied by adverse selection costs of stock trading. Building on this idea, Hong, Lim, and Stein (2000), Barth and Hutton (2004), and Frankel and Lee (2004) assume that information asymmetry is negatively related to analyst coverage. We expect that the pay-performance relation is increasing in firm size and analyst coverage. We estimate the following two regressions:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times ln(MV)_{it} + a_4 Ret_{it} + a_5 Ret_{it} \times MFd_{it} + a_6 Ret_{it} \times ln(MV)_{it} + a_7 MFd_{it} + a_8 ln(MV)_{it} + \varepsilon_{it}. \quad (9a)$$

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times ln(Coverage)_{it} + a_4 Ret_{it} + a_5 Ret_{it} \times MFd_{it} + a_6 Ret_{it} \times ln(Coverage)_{it} + a_7 MFd_{it} + a_8 ln(Coverage)_{it} + \varepsilon_{it}. \quad (9b)$$

We include each information environment proxy separately because of the high correlation between analyst coverage and firm size. For example, from Table 3, the Pearson correlation is 0.69. Untabulated analysis indicates that the coefficients for *MFd* interacted with performance are similar (i.e., positive and statistically significant) if we include both proxies in one regression.

Columns (1) and (2) of Table 8 (Panel A) present the results of estimating equations (9a) and (9b), respectively. In column (1), the coefficients of firm-size interacted with both performance variables are positive and statistically significant, consistent with expectations. In column (2), the coefficient on analyst coverage interacted with ΔROA is positive and statistically significant, while the coefficient on analyst coverage interacted with *Ret* is not significant. Across both columns, the coefficient on *MFd* interacted with the two performance variables remains positive and statistically significant. We conclude that our results are not attributable to the information environment as an alternative explanation.

5.2. Noisy performance measures

A standard agency theory prediction is that the less noise in a performance signal, the more weight the signal receives (Holmström 1979 and Banker and Datar 1989). It is possible that firms with management forecasts have less noisy performance metrics, which leads to a stronger pay-performance relation. The literature has documented that voluntary disclosures are negatively related to earnings volatility (e.g., Waymire 1985; Ajinkya et al. 2005). To control for this alternative explanation, we include controls for performance noise in our regressions. Following Core et al. (2003), we define $Var(\Delta ROA)$ as the historical annual variance of ΔROA for the ten years prior to and excluding year t. We require at least six years of ΔROA data. $Var(Ret)$ is defined similarly using historical annual variance of Ret. These measures proxy for the noise in ΔROA and returns, respectively. Because some of our sample firms have less than six years of data, our sample size for these tests is reduced to 8,086 firm-years. We estimate:

$$\begin{aligned}\Delta ln(Comp)_{it} = {} & a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} \\ & + a_3 \Delta ROA_{it} \times [Var(\Delta ROA)/Var(Ret)]_{it} \\ & + a_4\, Ret_{it} + a_5\, Ret_{it} \times MFd_{it} + a_6\, Ret_{it} \times [Var(\Delta ROA)/Var(Ret)]_{it} \\ & + a_7 MFd_{it} + a_8\, [Var(\Delta ROA)/Var(Ret)]_{it} + \varepsilon_{it}. \qquad (10)\end{aligned}$$

Table 8, Panel B presents the results of estimating equation (10). We find that the coefficient on ΔROA interacted with [the variance of ΔROA divided by the variance of *Ret*] is negative and statistically significant. The coefficient on returns interacted with [the variance of ΔROA divided by the variance of *Ret*] is not statistically significant. This pattern of results is consistent with prior empirical work (Core et al. 2003; Leone et al. 2006) as well as with the agency-theory prediction of a negative relation between the relative weight on two performance measures and the relative variances. The coefficients on *MFd* interacted with ΔROA and with *Ret* remain positive and statistically significant, consistent with the notion that differential noise does not explain our results.

5.3. Asymmetric sensitivity of compensation to stock returns

Leone et al. (2006) show that cash compensation is far more sensitive to negative than to positive stock returns. They argue that their results are consistent with boards of directors exercising discretion to reduce costly ex-post settling up in cash compensation paid to CEOs. Certainly, management forecasts are more likely for bad news according to the literature (e.g., Skinner 1994; Karamanou and Vafeas 2005). For example, our descriptive statistics in Table 2 show that the mean (median) annual returns for firms that issue MEFs is 0.10 (0.06), while it is 0.18 (0.11) for firms that do not issue MEFs. To test whether our results are sensitive to this asymmetric sensitivity to returns we estimate:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times D_{it} + a_4 Ret_{it} + a_5 Ret_{it} \times MFd_{it} + a_6 Ret_{it} \times D_{it} + a_7 MFd_{it} + a_8 D_{it} + \varepsilon_{it}. \quad (11)$$

D is an indicator variable that equals one if *Ret* is negative, and zero otherwise. Table 8, Panel C presents the result of this regression. We find that the coefficient on *Ret* interacted with *D* is positive and statistically significant, consistent with the findings of Leone et al. (2006). More importantly, the coefficients on the interaction of *MFd* and the two performance variables remain positive and statistically significant.

5.4. Investment opportunities

The literature has studied the effects of investment opportunities on the pay-performance relation. Lambert and Larcker (1987) predict and find that the relative weight on stock returns increases in growth options. Baber et al. (1996) argue that CEO compensation should be more sensitive to CEOs' actions for firms with more growth options. Core et al. (2003) test this claim and, like Baber et al., find results consistent with this claim if cash compensation is used but not if total compensation is used as the dependent variable. Leverage and firm age are also related to firms' investment opportunities (Leone et al. 2006). We test whether our results are sensitive to including these three variables by estimating:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times Book\text{-}Market_{it} + a_4 \Delta ROA_{it} \times Leverage_{it} + a_5 \Delta ROA_{it} \times FirmAge_{it} + a_6\, Ret_{it} + a_7\, Ret_{it} \times MFd_{it} + a_8\, Ret_{it} \times Book\text{-}Market_{it} + a_9\, Ret_{it} \times Leverage_{it} + a_{10}\, Ret_{it} \times FirmAge_{it} + a_{11}\, MFd_{it} + a_{12}\, Book\text{-}Market_{it} + a_{13}\, Leverage_{it} + a_{14}\, FirmAge_{it} + \varepsilon_{it}. \qquad (12)$$

Table 8, Panel D shows that the coefficients on firm age interacted with the two performance measures are positive, consistent with the pay-performance sensitivity increasing in firm age. The coefficients on the book-market and leverage variables interacted with the performance variables are not significant. The pay-performance relation continues to be stronger for firms that issue MEFs. Specifically, the coefficients on *MFd* interacted with Δ*ROA* and with *Ret* remain positive and statistically significant. Hence, these additional control variables have little effect on our results.

6. Quarterly versus Annual Management Earnings Forecasts

As discussed above, a debate continues regarding MEF issuance and managerial myopia. In particular, the U.S. Chamber of Commerce's Commission on the Regulation of U.S. Capital Markets in the 21st Century has recommended a move away from quarterly to annual earnings guidance. Given this ongoing debate and the mixed extant evidence (regarding the relation between the issuance of MEF and managerial myopia), we investigate whether our results are sensitive to the difference between annual and quarterly earnings guidance. We estimate the following specification using the sub sample of firms that issue MEFs:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFQtrOnly_{it} + a_3\, \Delta ROA_{it} \times MFBoth_{it} + a_4\, Ret_{it} + a_5\, Ret_{it} \times MFQtrOnly_{it} + a_6\, Ret_{it} \times MFBoth_{it} + a_7\, MFQtrOnly_{it} + a_8\, MFBoth_{it} + \varepsilon_{it}. \qquad (13)$$

This specification differs from those above in that we decompose the management forecast dummy into three mutually exclusive groups. *MFQtrOnly* equals one if the firm issue a quarterly forecast *but no* annual forecasts, zero otherwise. *MFBoth* equals one if the firm issues a quarterly *and* an annual forecast, zero otherwise. In this specification, the coefficients on ΔROA and *Ret* represent the pay-performance sensitivity for firms that issue annual forecasts *but no* quarterly forecasts. The coefficients of performance interacted with *MFQtrOnly* and *MFBoth* represent the incremental sensitivity of firms that issue only quarterly forecasts and firms that issue both quarterly and annual forecasts, respectively, relative to those firms that only issue annual forecasts.

Table 9 presents the results of these regressions. In all specifications, the coefficients on ΔROA and *RET* are positive and statistically significant. The coefficients on the interactions of *MFBoth* with performance are positive and statistically significant. This result is consistent with the notion that the combination of issuing quarterly *and* annual (i.e., a variety of) forecasts affects the pay-performance relation more strongly than issuing only annual forecasts. It also complements the results above that show compensation is increasing in the frequency of forecasts. The coefficients on the interactions of *MFQtrOnly* with performance, however, are not significant, which provides no evidence that the cash compensation sensitivity to performance for firms that issue only quarterly MEFs is different from firms that issue only annual MEFs. Hence in our setting, we provide no support that this quarterly-versus-annual distinction is important, at least with respect to the monitoring of management.

7. Conclusion

We examine whether improved disclosure leads to better monitoring of management. We posit that improved disclosure leads to a stronger observable relation between the effort (and decisions) of the CEO and the resulting performance of the firm. Consistent with this assertion and agency theory, we predict and find higher sensitivity of cash compensation to performance – both accounting and stock returns – for firms that issue management earnings forecasts, our empirical proxy for higher disclosure. In a sub-sample of firms that issue management earnings forecasts, we predict and find that the sensitivity of cash compensation to performance is increasing in the number of forecasts that firms issue during the year and in the number of consecutive years that firms have issued management forecasts. The results are robust to Heckman self-selection tests, matched-sample tests, and controls for the information environment, noise in our performance variables, the asymmetric sensitivity of cash compensation to returns, and variations in investment opportunities across firms.

Our analysis contributes to the literature in several ways. First, we examine how agency problems can be mitigated through greater disclosure. Several empirical studies relate better disclosure to better firm performance and implicitly assume that disclosure leads to better monitoring, which in turn leads to better performance. By focusing on the pay-performance relation, we establish a more direct link between disclosure and monitoring. Second, we contribute to the limited literature on disclosure and corporate governance. These papers focus on incentives or the determinants to disclose, while our paper is about the effects of disclosure. Third, our study also informs the current debate about the role of MEF issuance. Critics have called for an end to MEFs, purporting that such guidance creates incentives for firms to manage earnings upwards, distort earnings, or act myopically. We are agnostic about the costs of management guidance and do not suggest an equilibrium amount of MEF issuance. We simply point out that improved monitoring of CEOs represents a potential benefit that should be considered in any analyses of management guidance.

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APPENDIX
Variable Definitions

Variable		Definition
Beta	=	equity beta for the fiscal period, calculated in yearly regressions of daily firm returns on daily market-wide (S&P 500) returns.
Book-Market	=	ratio of book value to market value of equity for the firm.
Comp	=	CEO cash compensation, measured as the sum of salary and bonus.
Consistency	=	number of consecutive years in which the firm has provided a forecast, including the current year.
Coverage	=	number of *First Call* analysts that issue earnings forecasts for the firm during the fiscal year.
D	=	indicator variable that equals one if *Ret* is negative, and zero otherwise.
FD	=	indicator variable that equals one for years 2000 and later, and zero otherwise.
FirmAge	=	fiscal year of the observation minus the year the firm first appeared on CRSP.
Frequency	=	number of management earnings forecasts issued by the firm during the year.
Institution	=	percentage of the firm's common equity held by institutional investors.
InvMills	=	Inverse Mills ratio from the first stage of a model that predicts whether firms issue a quantitative management forecast or not.
Leverage	=	debt divided by assets.
Litigate	=	indicator variable that equals one for all firms in the biotechnology (SIC codes 2833-2836), R&D services (8731-8734), programming (7371-7379), computers (3570-3577), electronics (3600-3674) and retail (5200-5961) industries, and zero otherwise, as in Ajinkya et al. (2005).
Loss	=	indicator variable that equals one if the firm reported losses in the current period, and zero otherwise.
MFBoth	=	indicator variable that equals one if the firm issues an annual and a quarterly management earnings forecast, and zero otherwise.
MFd	=	indicator variable that equals one if the firms issues a management earnings forecast (either quarterly or annual), and zero otherwise.
MFQtrOnly	=	indicator variable that equals one if the firm issues quarterly but no annual management earnings forecast, and zero otherwise.
MV	=	equity market value (in $ millions) measured at the beginning of the year.
News	=	indicator variable that equals one if current EPS is greater than previous-year's EPS, and zero otherwise.
Ret	=	annual total raw return to shareholders during the fiscal year.
ROA	=	net income before extraordinary items divided by lagged total assets.
Var(Ret)	=	historical annual variance of *Ret* for the ten years prior to and excluding year *t* and is calculated only for firms with at least six years of *Ret* data.
Var(ΔROA)	=	historical annual variance of Δ*ROA* for the ten years prior to and excluding year *t* and is calculated only for firms with at least six years of Δ*ROA* data.
Δ	=	symbol for change in the variable.
ln( )	=	the natural logarithm of a variable

TABLE 1
Sample Selection

This table summarizes the process used to select our sample (Panel A), and the breakdown of our sample by whether the firm issued a management earnings forecast and by year (Panel B).

Panel A: Sample selection procedure

Criteria	Number of Observations
Total CEO-year observations in ExecuComp where CEO was in office for most of the year	13,754
Less:	
Observations with insufficient data to calculate change in total cash compensation	2,618
Observations that could not be matched with CRSP	600
Observations with insufficient data on Compustat	187
Observations where the absolute value of the change in log (cash compensation) exceeds 2	45
Observations where the firm-year is not in the First Call Analyst database	198
Remove firms with top/bottom 1% of $\Delta ln(Comp)$, *Ret*, and ΔROA	531
Total observation in full sample from 1998 to 2005	9,575

Panel B: Distribution of observations by year

Year	Mgmt Forecasting Firms	Non-Mgmt Forecasting Firms	Total
1998	580	541	1,121
1999	618	531	1,149
2000	703	504	1,207
2001	906	304	1,210
2002	900	353	1,253
2003	864	365	1,229
2004	838	394	1,232
2005	764	410	1,174
Total	6,173	3,402	9,575

TABLE 2
Descriptive Statistics

This table provides descriptive statistics for the 9,575 firm-years in our sample (see Table 1 for sample selection procedure). All differences between the management forecasting and non-forecasting firms are statistically significant at the 5% level for both parametric (*t*-test) and non-parametric (Wilcoxon) tests, with the exceptions of *Loss*, *var(ΔROA)*, *var(RET)*, *Leverage* and *FirmAge*, which are not significantly different. A firm is classified as a management-forecasting firm if the firm issues a quantitative management earnings forecast during the year, and is classified as a non-management-forecasting firm otherwise. Variables are defined in the Appendix.

	Mgmt Forecasting Firm Years				Non-Mgmt Forecasting Firm Years			
Variable	*N*	Mean	STD	Median	*N*	Mean	STD	Median
Comp	6,173	1,585	1,677	1,136	3,402	1,426	1,569	975
Δln(Comp)	6,173	0.06	0.37	0.06	3,402	0.10	0.32	0.08
ROA	6,173	0.05	0.09	0.05	3,402	0.05	0.11	0.04
ΔROA	6173	-0.009	0.071	-0.001	3,402	0.002	0.068	0.001
Ret	6,173	0.10	0.45	0.06	3,402	0.18	0.50	0.11
MV	6,166	7,797	25,279	1,646	3,399	5,546	18,026	1,226
Institution	5,704	0.67	0.18	0.70	3,129	0.61	0.20	0.63
Coverage	6,173	10.82	6.61	9.00	3,402	9.09	6.92	7.00
Litigate	6,173	0.29	0.45	0.00	3,402	0.19	0.40	0.00
Book-Market	6,094	0.52	0.41	0.44	3,337	0.54	0.50	0.46
Loss	6,173	0.14	0.35	0.00	3,402	0.15	0.35	0.00
News	6,173	0.55	0.50	1.00	3,402	0.60	0.49	1.00
Beta	6,096	0.96	0.52	0.88	3,347	0.88	0.53	0.80
FD	6,173	0.81	0.40	1.00	3,402	0.68	0.46	1.00
Var(Ret)	5,183	0.54	2.85	0.15	2,903	0.44	1.48	0.15
Var(ΔROA)	5,183	0.04	0.84	0.001	2,903	0.03	0.54	0.001
D	6,173	0.43	0.50	0.00	3,402	0.37	0.48	0.00
Leverage	6,147	0.23	0.17	0.23	3,396	0.23	0.21	0.21
FirmAge	6,169	23.8	19.6	17.0	3,400	23.1	17.4	19.0
Frequency	6,173	5.03	4.39	4.00	3,402	0.00	0.00	0.00
Consistency	6,173	3.55	2.31	3.00	3,402	0.00	0.00	0.00
MFBoth	6,173	0.50	0.50	1.00	3,402	0.00	0.00	0.00
MFQtrOnly	6,173	0.30	0.46	0.00	3,402	0.00	0.00	0.00

TABLE 3
Correlations

This table reports Spearman (Pearson) correlations for the variables in our sample (see Table 1 for sample selection procedure). Spearman (Pearson) correlations are reported in the upper (lower) diagonal. Variables are defined in the Appendix. ***, ** and * denote significance at the 1%, 5% and 10% levels.

	Δln(Comp)	*ΔROA*	*Ret*	*ln(MV)*	*ln(Coverage)*	*Book-Market*	*Leverage*	*FirmAge*	*MFd*
Δln(Comp)		0.35***	0.31***	0.02*	0.05***	-0.12***	0.01	0.01	-0.05***
ΔROA	0.28***		0.30***	0.02*	0.04***	-0.13***	-0.05***	0.04***	-0.07***
Ret	0.27***	0.24***		-0.02*	0.03***	-0.32***	-0.07***	0.01	-0.07***
ln(MV)	-0.00	0.02	-0.08***		0.72***	-0.36***	0.07***	0.27***	0.10***
ln(Coverage)	0.04***	0.03***	0.01	0.69***		-0.29***	0.01	0.05***	0.15***
Book-Market	-0.11***	-0.10***	-0.28***	-0.33***	-0.26***		0.17***	0.06***	-0.02**
Leverage	-0.00	-0.01	-0.07***	0.04***	-0.01	0.12***		0.20***	0.03***
FirmAge	0.01	0.04***	-0.04***	0.33***	0.07***	0.01	0.16***		-0.01
MFd	-0.05***	-0.08***	-0.08***	0.10***	0.18***	-0.02**	0.01	0.02*	

TABLE 4
Management Forecast Issuance and the Pay-Performance Relation

This table reports the test results of the difference in pay-performance sensitivity for firms that issue and do not issue management earnings forecasts. The sample includes all firms. We estimate various specifications of the following:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 Ret_{it} + a_4 Ret_{it} \times MFd_{it} + a_5 MFd_{it} + \varepsilon_{it}.$$

Year fixed effects are included for each model but not tabulated. We estimate each model as a panel and cluster the standard errors at the firm level. Coefficient *t*-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise. ***, ** and * denotes significance at the 1%, 5% and 10% levels, respectively. Variables are defined in the Appendix.

	Predict. Sign	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	?	0.057*** (6.58)	0.024*** (2.88)	0.040*** (4.69)	0.070*** (7.58)	0.047*** (5.03)	0.055*** (5.94)
ΔROA	+	1.306*** (19.19)		1.023*** (15.12)	0.936*** (8.65)		0.770*** (7.22)
$\Delta ROA \times MFd$	+				0.543*** (4.08)		0.357*** (2.69)
Ret	+		0.224*** (24.59)	0.187*** (20.35)		0.161*** (12.88)	0.140*** (11.08)
$Ret \times MFd$	+					0.105*** (6.22)	0.077*** (4.52)
MFd	?				-0.024*** (-3.57)	-0.035*** (-5.02)	-0.023*** (-3.27)
Year Effects		Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.		9,575	9,575	9,575	9,575	9,575	9,575
Adj. R^2		0.0849	0.0987	0.1361	0.0886	0.1039	0.1406

TABLE 5
Frequency and Consistency of Management Forecasts and the Pay-Performance Relation

This table reports the test results of the difference in pay-performance sensitivity for firms that issue management earnings forecasts more frequently during the year (i.e., frequency) and over a larger number of consecutive years (i.e., consistency). The sample includes only firms that issue management forecasts. We estimate various specifications of the following:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times ln(Frequency)_{it} + a_3\, Ret_{it} + a_4\, Ret_{it} \times ln(Frequency)_{it} + a_5\, ln(Frequency)_{it} + \varepsilon_{it}.$$

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times ln(Consistency)_{it} + a_3\, Ret_{it} + a_4\, Ret_{it} \times ln(Consistency)_{it} + a_5\, ln(Consistency)_{it} + \varepsilon_{it}.$$

Year fixed effects are included for each model but not tabulated. We estimate each model as a panel and cluster the standard errors at the firm level. Coefficient *t*-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise. ***, ** and * denotes significance at the 1%, 5% and 10% levels, respectively. Variables are defined in the Appendix.

	Predict. Sign	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	?	0.046***	0.028**	0.045***	0.027*	0.004	0.026*
		(3.18)	(1.93)	(3.15)	(1.74)	(0.23)	(1.70)
ΔROA	+	0.710***		0.698***	1.144***		0.987***
		(3.70)		(3.50)	(5.31)		(4.58)
ΔROA × ln(Frequency)	+	0.532***		0.282***			
		(4.35)		(2.26)			
ΔROA × ln(Consistency)	+				0.258**		0.093
					(1.62)		(0.58)
Ret	+		0.131***	0.111***		0.188***	0.160***
			(4.66)	(3.89)		(5.71)	(4.83)
Ret × ln(Frequency)	+		0.101***	0.080***			
			(5.63)	(4.36)			
Ret × ln(Consistency)	+					0.067***	0.051**
						(2.77)	(2.02)
ln(Frequency)	?	0.002	-0.008	-0.005			
		(0.33)	(-1.15)	(-0.71)			
ln(Consistency)	?				0.022**	0.014	0.013
					(2.53)	(1.57)	(1.46)
Year Effects		Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.		6,173	6,173	6,173	6,173	6,173	6,173
Adj. R^2		0.1042	0.1257	0.1661	0.1018	0.1220	0.1619

TABLE 6
Self-Selection Model

This table reports the test results of the difference in pay-performance sensitivity for firms that issue and do not issue management earnings forecasts controlling for self-selection. The sample includes all firms except those with insufficient data for the first-stage model. Panel A presents the results of estimating the following first-stage model that predicts whether management issues a forecast:

$$MFd_{it} = a_0 + a_1\, ln(MV)_{it} + a_2\, Institution_{it} + a_3\, ln(Coverage)_{it} + a_4\, Litigate_{it} + a_5\, Book\text{-}Market_{it} + a_6\, Loss_{it} + a_7\, News_{it} + a_8\, Beta_{it} + a_9\, FD_t + \varepsilon_t.$$

This model is estimated using a logistic model where the dependent variable is binary and equals one if the firm issues a quantitative management earnings forecast in year t, and equals zero otherwise. Coefficient standard errors are in parentheses. Panel B presents the results of the following second-stage model:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times InvMills_{it} + a_4\, Ret_{it} + a_5\, Ret_{it} \times MFd_{it} + a_6\, Ret_{it} \times InvMills_{it} + a_7\, MFd_{it} + a_8\, InvMills_{it} + \varepsilon_{it}.$$

We estimate this model as a panel and cluster the standard errors at the firm level. Coefficient *t*-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise. ***, ** and * denotes significance at the 1%, 5% and 10% levels, respectively. Variables are defined in the Appendix.

Panel A: First-stage model predicting whether firms issue a management forecast

	Predict. Sign	Coefficient (Standard error)
Intercept	?	-0.910*** (0.11)
ln(MV)	+	0.003 (0.01)
Institution	+	0.87*** (0.08)
ln(Coverage)	+	0.25*** (0.03)
Litigate	?	0.30*** (0.04)
Book-Market	+	0.10*** (0.04)
Loss	–	-0.02 (0.05)
News	–	-0.17*** (0.03)
Beta	–	-0.09*** (0.03)
FD	+	0.34*** (0.04)
No. of Obs.		8,575
Log-Likelihood		617.5
% Concordant		65.1

TABLE 6 (Continued)

Panel B: Second-stage pay-performance model controlling for self-selection

	Predict. Sign	(1)	(2)	(3)
Intercept	?	0.049*** (2.73)	-0.042** (-2.21)	0.009 (0.46)
ΔROA	+	1.720*** (6.69)		1.443*** (5.74)
$\Delta ROA \times MFd$	+	0.375*** (2.51)		0.236* (1.60)
$\Delta ROA \times InvMills$	?	-1.071*** (-3.32)		-0.952*** (-3.00)
Ret	+		0.267*** (8.11)	0.208*** (6.37)
$Ret \times MFd$	+		0.082*** (4.34)	0.063*** (3.35)
$Ret \times InvMills$	?		-0.149*** (-3.41)	-0.098** (-2.26)
MFd	?	-0.018*** (-2.56)	-0.022*** (-2.83)	-0.014* (-1.88)
InvMills	?	0.022 (1.26)	0.102*** (5.48)	0.052*** (2.84)
Year Effects		Yes	Yes	Yes
No. of Obs.		8,575	8,575	8,575
Adj. R^2		0.0967	0.1080	0.1479

TABLE 7
Matched Sample

This table reports the test results of the difference in pay-performance sensitivity for firms that issue and do not issue management earnings forecasts. The sample includes 1,709 firm-year pairs of disclosers and non disclosures matched on year, industry membership, size and analyst following. We estimate various specifications of the following:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3\, Ret_{it} + a_4\, Ret_{it} \times MFd_{it} + a_5 MFd_{it} + \varepsilon_{it}.$$

Year fixed effects are included for each model but not tabulated. We estimate each model as a panel and cluster the standard errors at the firm level. Coefficient *t*-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise. ***, ** and * denotes significance at the 1%, 5% and 10% levels, respectively. Variables are defined in the Appendix.

	Predict. Sign	(1)	(2)	(3)
Intercept	?	0.063*** (4.07)	0.037** (2.40)	0.044*** (2.88)
ΔROA	+	0.892*** (5.82)		0.715*** (4.76)
$\Delta ROA \times MFd$	+	0.580*** (2.74)		0.405** (1.93)
Ret	+		0.177*** (10.05)	0.157*** (8.98)
$Ret \times MFd$	+		0.073*** (2.99)	0.048** (1.99)
MFd	?	-0.041*** (-3.68)	-0.047*** (-4.03)	-0.037** (-3.23)
Year Effects		Yes	Yes	Yes
No. of Obs.		3,418	3,418	3,418
Adj. R^2		0.0884	0.1081	0.1404

TABLE 8
Alternative Explanations

This table investigates alternative explanations for our Table 4 result that the pay-performance sensitivity is stronger for firms that issue management forecasts. The sample includes all firms with available data. In panel A, we include variables that proxy for the information environment. We estimate the following two regressions:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times ln(MV)_{it} + a_4 Ret_{it} + a_5 Ret_{it} \times MFd_{it} + a_6 Ret_{it} \times ln(MV)_{it} + a_7 MFd_{it} + a_8 ln(MV)_{it} + \varepsilon_{it}.$$

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times ln(Coverage)_{it} + a_4 Ret_{it} + a_5 Ret_{it} \times MFd_{it} + a_6 Ret_{it} \times ln(Coverage)_{it} + a_7 MFd_{it} + a_8 ln(Coverage)_{it} + \varepsilon_{it}.$$

In Panel B, we include variables that proxy for noise in our performance variables. We estimate:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times [Var(\Delta ROA)/Var(Ret)]_{it} + a_4 Ret_{it} + a_5 Ret_{it} \times MFd_{it} + a_6 Ret_{it} \times [Var(\Delta ROA)/Var(Ret]_{it} + a_7 MFd_{it} + a_8 [Var(\Delta ROA)/Var(Ret)]_{it} + \varepsilon_{it}.$$

In Panel C, we include variables that proxy for the asymmetric sensitivity of compensation to returns. We estimate:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times D_{it} + a_4 Ret_{it} + a_5 Ret_{it} \times MFd_{it} + a_6 Ret_{it} \times D_{it} + a_7 MFd_{it} + a_8 D_{it} + \varepsilon_{it}.$$

In Panel D, we include other variables related to firms' investment opportunities that have been shown to affect the pay-performance relation. We estimate:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFd_{it} + a_3 \Delta ROA_{it} \times Book\text{-}Market_{it} + a_4 \Delta ROA_{it} \times Leverage_{it} + a_5 \Delta ROA_{it} \times FirmAge_{it} + a_6 Ret_{it} + a_7 Ret_{it} \times MFd_{it} + a_8 Ret_{it} \times Book\text{-}Market_{it} + a_9 Ret_{it} \times Leverage_{it} + a_{10} Ret_{it} \times FirmAge_{it} + a_{11} MFd_{it} + a_{12} Book\text{-}Market_{it} + a_{13} Leverage_{it} + a_{14} FirmAge_{it} + \varepsilon_{it}.$$

Year fixed effects are included for each model but not tabulated. We estimate each model as a panel and cluster the standard errors at the firm level. Coefficient *t*-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise. ***, ** and * denotes significance at the 1%, 5% and 10% levels, respectively. Variables are defined in the Appendix.

TABLE 8 (Continued)

Panel A: Information environment

	Predict. Sign	(1)	(2)
Intercept	**?**	0.049***	0.023**
		(3.12)	(2.06)
ΔROA	**+**	0.150	0.459***
		(0.47)	(2.51)
$\Delta ROA \times MFd$	**+**	0.298**	0.293**
		(2.24)	(2.22)
$\Delta ROA \times ln(MV)$	**+**	0.095**	
		(2.09)	
$\Delta ROA \times ln(Coverage)$	**+**		0.174**
			(2.03)
Ret	**+**	0.006	0.128***
		(0.14)	(5.40)
$Ret \times MFd$	**+**	0.068***	0.076***
		(4.10)	(4.47)
$Ret \times ln(MV)$	**+**	0.021***	
		(3.64)	
$Ret \times ln(Coverage)$	**+**		0.006
			(0.58)
MFd	**?**	-0.022***	-0.027***
		(-3.20)	(-3.89)
ln(MV)	**?**	0.0004	
		(0.21)	
ln(Coverage)	**?**		0.018***
			(4.63)
Year Effects		Yes	Yes
No. of Obs.		9,565	9,575
Adj. R^2		0.1441	0.1429

TABLE 8 (Continued)

Panel B: Noisy performance measures

	Predict. Sign	
Intercept	?	0.055*** (5.56)
ΔROA	+	0.949*** (6.86)
$\Delta ROA \times MFd$	+	0.330** (2.01)
$\Delta ROA \times [Var(\Delta ROA)/Var(Ret)]$	-	-0.423*** (-2.37)
Ret	+	0.156*** (10.05)
$Ret \times MFd$	+	0.071*** (3.55)
$Ret \times [Var(\Delta ROA)/Var(Ret)]$	+	-0.018 (-0.55)
MFd	?	-0.028*** (-3.66)
$[Var(\Delta ROA)/Var(Ret)]$	?	-0.030** (-2.23)
Year Effects		Yes
No. of Obs.		8,086
Adj. R^2		0.1469

TABLE 8 (Continued)

Panel C: Asymmetric sensitivity of compensation to returns

	Predict. Sign	
Intercept	**?**	0.105*** (10.02)
ΔROA	**+**	0.862*** (6.88)
$\Delta ROA \times MFd$	**+**	0.382*** (2.90)
$\Delta ROA \times D$	?	-0.244* (-2.01)
Ret	**+**	0.074*** (5.35)
$Ret \times MFd$	**+**	0.059*** (3.64)
$Ret \times D$	**+**	0.114*** (3.51)
MFd	**?**	-0.017** (-2.49)
D	**?**	-0.075*** (-6.67)
Year Effects		Yes
No. of Obs.		9,575
Adj. R^2		0.1500

TABLE 8 (Continued)

Panel D: Investment opportunities

	Predict. Sign	
Intercept	?	0.053***
		(4.64)
ΔROA	+	0.268**
		(1.82)
ΔROA × MFd	+	0.449***
		(3.38)
ΔROA × Book-Market	?	0.023
		(0.16)
ΔROA × Leverage	?	0.283
		(0.77)
ΔROA × FirmAge	?	0.025***
		(5.16)
Ret	+	0.108***
		(6.25)
Ret × MFd	+	0.071***
		(4.25)
Ret × Book-Market	?	-0.017
		(-1.40)
Ret × Leverage	?	0.087
		(1.62)
Ret × FirmAge	?	0.002**
		(2.55)
MFd	?	-0.020***
		(-2.88)
Book-Market	?	-0.021**
		(2.19)
Leverage	?	0.053***
		(2.87)
FirmAge	?	-0.000
		(-0.16)
Year Effects		Yes
No. of Obs.		9,351
Adj. R^2		01544

TABLE 9
Annual versus Quarterly Management Earnings Forecasts

This table reports the test results of the difference in pay-performance sensitivity for firms that issue only annual, only quarterly, or both annual and quarterly management earnings forecasts. The sample includes only firms that issue management forecasts. We estimate various specifications of the following:

$$\Delta ln(Comp)_{it} = a_0 + a_1 \Delta ROA_{it} + a_2 \Delta ROA_{it} \times MFQtrOnly_{it} + a_3\, \Delta ROA_{it} \times MFBoth_{it} + a_4 Ret_{it} + a_5 Ret_{it} \times MFQtrOnly_{it} + a_6 Ret_{it} \times MFBoth_{it} + a_7 MFQtrOnly_{it} + a_8 MFBoth_{it} + \varepsilon_{it}.$$

Year fixed effects are included for each model but not tabulated. We estimate each model as a panel and cluster the standard errors at the firm level. Coefficient *t*-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise. ***, ** and * denotes significance at the 1%, 5% and 10% levels, respectively. Variables are defined in the Appendix.

	Predict. Sign	(1)	(2)	(3)
Intercept	?	0.073*** (4.78)	0.044*** (2.75)	0.055*** (3.48)
ΔROA	+	1.065*** (4.10)		0.755*** (2.98)
$\Delta ROA \times MFQtrOnly$	?	0.227 (0.81)		0.284 (1.02)
$\Delta ROA \times MFBoth$	?	0.683** (2.43)		0.501* (1.81)
Ret	+		0.215*** (6.94)	0.196*** (6.37)
$Ret \times MFQtrOnly$	?		0.022 (0.63)	-0.011 (-0.32)
$Ret \times MFBoth$	?		0.112*** (3.24)	0.073** (2.11)
MFQtrOnly	?	-0.031*** (-2.61)	-0.032** (-2.43)	-0.018 (-1.36)
MFBoth	?	-0.025** (-2.32)	-0.027** (-2.22)	-0.019 (-1.55)
Year Effects		Yes	Yes	Yes
No. of Obs.		6,173	6,173	6,173
Adj. R^2		0.1038	0.1237	0.1643