Are CEOs Incentivized to Shelter Good Information?*

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1 Introduction

Prior literature documents that CEOs with high pay–performance incentives are motivated to withhold firm-specific information in order to manipulate stock prices (eg., Bergstresser and Philippon (2006); Benmelech et al. (2010); Healy (1985); Tirole (2010) and Peng and Röell (2008; 2014)). Information on firms can be either good or bad. Theoretical works imply that high pay–performance incentives drive CEOs to withhold both good and bad information. On one hand, CEOs with high incentives care about their stock and option exposure to short–run price risk. To mitigate short–run price risk, they conceal bad information to inflate firms' short-run stock prices (e.g., Benmelech et al. (2010); Jin and Myers (2006); and Peng and Röell (2008; 2014)). On the other hand, highly incentivized CEOs also care about the exposure of their incentive portfolios to the price risk in the long run. To mitigate the long–run price risk, CEOs withhold current good information for future release to offset the potential bad information in the future (e.g., Fudenberg and Tirole (1995), Tirole (2010)).

In contrast to the theoretical works, empirical studies such as Hutton et al. (2009) directly conjecture (without empirical tests) that managers "do not face incentives to shelter good information". In order to mitigate the tension between theoretical and empirical studies, this paper strives to answer two questions: (i). Are CEOs incentivized to shelter good information? (ii). Since CEOs are incentivized to balance firms' market performance in both short run and long run, are they incentivized to evenly shelter firms' good and bad information?

To address the above two questions, we need to measure the degrees of both good and bad information manipulation by CEOs. Existing literature typically employs fundamental accruals as the proxy of information manipulation. However, there are at least two limitations to use the accrual-based proxy for information manipulation. First, accrual-based proxies cannot capture the whole implementation of managerial information manipulation. Managers can use channels other than accruals such as investment strategies or management earnings guidance to manipulate investors' expectation on firms' future cash flows (e.g., Cohen et al. (2008); Fudenberg and Tirole (1995); Hutton et al. (2009); and Tasker (1998)). Moreover, fundamental accruals are constructed in absolute terms and thus cannot judge the direction of manipulation.

To overcome the first limitation and capture all channels for CEOs to withhold information, we turn to the R^2 of stock price, a well-documented measure for the informativeness of stock prices (e.g., Roll (1988); Morck et al. (2000); Li et al. (2004) and Hutton et al. (2009)). Higher stock prices' R^2 is associated with low informativeness. Thus, a positive relation between R^2 and CEO pay-performance incentive indicates that high equity incentives drive CEOs to withhold firm-specific information. Building on the R^2, we employ novel measures, the positive and negative R^2 (R^2_+ and R^2_-) in order to judge the type of information (positive or negative) CEOs withhold. Specifically, positive R^2 (R^2_+) for a firm/year is the R^2 associated with the only positive daily return sample, measuring the informativeness of a firm's positive market performance. By the same token, negative R^2 for a specific firm/year gauges the informativeness of a firm's negative market performance.

This paper finds that managers with high pay–performance incentives are associated with higher R^2_+s but irrelevant to R^2_-s in all econometric specifications. Since high R^2_+ is equivalent to low informativeness of good market performance, these findings reveal that highly incentivized CEOs shelter good news and only good news rather than the bad ones. This CEOs' asymmetric information manipulation is consistent with the combination of two strands of theoretical works. First, it is consistent with Fudenberg and Tirole (1995) and Tirole (2010) who demonstrate that CEOs with high pay–performance incentives have the motivation to withhold good information in order to smooth firms' market performance in a longer horizon. This result is also consistent with theoretical works such as Yermack (1995) and Yermack (1997): the CEOs with high pay–performance incentives are fear of withholding bad news because their incentive portfolios are exposed to big losses once investors identify their manipulation.

A naturally next question is: what are channels for incentivized CEOs to withhold good news? Managers can manipulate good information through different sources, either through accrual-based earnings manipulations (e.g., Bergstresser and Philippon (2006)) or through real earnings management (e.g., Cohen et al. (2008)). To identify the exact channel, we first regress real earnings management measures (or accrual-based earnings management measures) on *Delta* incentive and construct *Delta*-predicted real earnings management (or accrual-based earnings management). We can then draw inferences on the exact channel by exploring the relation between R^2_+ and *Delta*-predicted real earnings management (and accrual-based earnings management). Specifically, given the positive relation between *Delta* incentive and the proxies for real earnings management, the *Delta* incentive-driven real earnings management is positively associated with R^2_+. In other words, CEOs are motivated to increase the real earnings management activity in order to withhold good news from the perception of investors. We repeat the exact procedure for discretionary accrual but receive no significant relation. Thus, investment manipulation but not accrual-based earnings manipulation is the exact channel for CEOs to withhold good information. This finding is consistent with Cohen et al. (2008) that real earnings management dominates accrual-based earnings management after the passage of Sarbanes-Oxley Act.

As documented in prior literature (e.g., Bergstresser and Philippon (2006); Healy (1985); Peng and Röell (2014)), the information manipulation by CEOs inevitably affects the higher-order moments of stock returns. These studies immediately raise another question: Does incentivized CEOs' one-sided manipulation on good news result in fat tails generally or only one-sided exposure to stock lottery-like behavior? We answer this question by exploring the relation between measures of extreme returns and the good information manipulation caused by CEOs with high incentives. Specifically, we measure the degree of CEOs' good news manipulation by the *Delta* incentive-driven R^2_+ ($\widehat{R^2_+}(Delta)$)[1] and look at its predictability separately on the jump and crash frequencies of stock returns. We find that the $\widehat{R^2_+}(Delta)$ is negatively associated with both jump and crash frequencies. In other words, the good

[1] $\widehat{R^2_+}(Delta)$ is constructed by regressing R^2_+ on *Delta* to get the predicted value of R^2_+.

information manipulation of incentivized CEOs reduces not only the stock lottery-like behavior but also crash risk of stocks, leading the corresponding firms to the "no surprise" state.

To alleviate the CEOs' information manipulation problem, we examine the impact of two important monitors on CEOs' behavior: institutional shareholders and financial analysts. As the internal corporate governance device (Hartzell and Starks (2003)), the institutional shareholders in one firm can stimulate the CEO to conduct more voluntary disclosure and thus enhances the firms' information quality (eg., Healy et al. (1999); Core (2001)). As external monitors, financial analysts play an important role in reducing information manipulaiton (Yu (2008)). We find managers in firms with higher institutional shareholder concentration and broader analyst coverage shelter less good information.

Furthermore, both incentive contract design and CEO characteristics matter for the information manipulation problem. We find CEOs with more experience and longer compensation duration are less likely to withhold good firm-specific information. These results are in line with the arguments in Pan et al. (2015) that the real performance of a manager can be better predicted by investors in the long run. Our findings are also consistent with Gopalan et al. (2014) that CEOs' information manipulation is restricted by longer pay-performance duration.

Finally, in the post Sarbanes-Oxley Act (SOX) era, the relation between managerial incentive compensation and the good information manipulation has been marginally reduced. This finding indicates that in contrast to using earnings manipulation (e.g., Cheng and Warfield (2005); Hutton et al. (2009)), using real investment to shelter good information (e.g., Cohen et al. (2008)) is not fully constrained even after the passage of SOX.

This paper contributes to the existing literature from at least two aspects. First, to the best of our knowledge, our paper is the first empirical study exploring the tension between prior theoretical and empirical studies on the good and bad information manipulation by CEOs. Our findings support the link between CEOs' pay-performance incentive and their good information sheltering behavior as argued in Fudenberg and Tirole (1995) and Tirole (2010). In contrast, we find no empirical link between *Delta* incentive and bad news shrouding behavior, casting doubt on theoretical works such as Benmelech et al. (2010) and Peng and Röell but supporting Yermack (1995; 1997). Moreover, this paper also contributes to the R^2 literature. Our work is among the first to detect the different information contents of R^2s in positive and negative return sample. We find that CEO *Delta* incentive contributes to only R^2_+ but not R^2_-.

The rest of this paper is structured as follows. Section 2 discusses the tension in prior research and builds up hypotheses. Section 3 discusses the data and our methodology. Section 4 provides our main results. Section 5 concludes.

2 Hypotheses Development

In this section, we briefly discuss the tension between underlying theoretical and empirical works to motivate the hypotheses for our empirical tests.

Agency models assume that CEOs with high pay–performance incentives are willing to take every possibility to withhold firm-specific information. When they encounter temporary bad performance, highly incentivized CEOs tend to shroud up this bad information to protect the exercise value of their incentive contracts (e.g., Jin and Myers (2006); Benmelech et al. (2010)). When good information comes (e.g., Fudenberg and Tirole (1995)), these CEOs prefer to shelter a large fraction of the good information but only release a small piece. The reason is that when bad information comes in the future, CEOs can offset the bad information by releasing the previous hided good information. Thus, agency models argues CEOs withhold both good and bad information to maximize the exercise value of their incentive contracts in the short–run and long–run.

Surprisingly, empirical studies (e.g., Hutton et al. (2009)) refute (without tests) the possibility of CEOs' good information manipulation behavior discussed in theoretical works but only focus on CEOs' bad news manipulation. To mitigate the tension between theoretical and empirical studies, we spell out the following hypothesis:

- (**H1a**): CEOs with high equity incentives tend to withhold good information from investors.

Simultaneously, there exists a debate on whether high equity incentives motivate CEOs to withhold bad information. Jin and Myers (2006) and Benmelech et al. (2010) among others, argue that CEOs are willing to personally absorb temporary losses instead of releasing the news to the public. In contrast, Yermack (1995; 1997) cast doubt on the motivation of incentivized CEOs to conceal bad information by discussing the potential high cost for manipulation. To justify the debate, we spell out the following hypothesis:

- (**H1b**): CEOs with high equity incentives tend to withhold bad information from investors.

To test the above hypotheses, we need to explore the relation between *Delta* incentive and the corresponding informativeness of stock returns. Prior literature demonstrates that stock return R^2 captures the informativeness of a stock. Higher R^2 indicates that the stock is more synchronous with the market and thus has less firm-specific information released.

As argued in Patton and Sheppard (2013) and Barndorff-Nielsen and Veraart (2012), employing even functions (R squares, absolute values) eliminates the information contained in the sign of returns. Applying their argument to our case, R^2 cannot capture the potentially different degrees of informativenss contained in positive and negative returns. we define the informativeness corresponding to the good (bad) information perceived by investors as R^2_+ (R^2_-), the component of positive (negative) return sample explained by the market and industry factors. A higher R^2_+ (R^2_-) of one stock implies higher co-movement with stocks in the market, thus less firm-specific good (bad)information. Consequently, a positive relation between R^2_+ (R^2_-) and *Delta* reveals that CEOs with high *Delta* incentives are associated with the low positive (negative) informativeness of their firms, evident for good (bad) information manipulation. Equivalently, we can restate hypotheses **H1a** and **H1b** as follows:

- (**H1a'**): CEO *Delta* incentive is positively associated with R^2_+.
- (**H1b'**): CEO *Delta* incentive is positively associated with R^2_-.

To strengthen the empirical link between *Delta* incentive and the informativeness of stock returns, we go one step further by detecting the channels for CEOs to withhold information. The exploration on channels fully reveals the superiority of using R^2-related measures to capture the informativeness of stocks. Prior literature employs discretionary accruals to measure information manipulation. However, to withhold good and bad information from the investors, CEOs can employ not only accrual-based earnings management but also real earnings management (e.g., Cohen et al. (2008)). Thus, the discretionary accruals definitely fail to capture the real earnings management such as reported low cost of good sold through increased production, sales acceleration through price discount, and decreases in discretionary expenses (e.g., Cohen et al. (2008); Roychowdhury (2006); Zang (2007)). Moreover, information manipulation measures based on firm fundamentals such as discretionary accruals can only capture the existence of CEOs' information manipulation but not investors' perception on these CEOs' manipulation. In other words, the existence of CEOs' information manipulation is not equivalent to their successful distortion of stock returns' informativeness.

In contrast to discretionary accruals, our price-based informativeness measures, R^2_+ and R^2_-, incorporate investors' perception of CEOs' channels for information manipulation. To identify the exact channel for incentivized CEOs to distort stock returns' informativeness, we spell out the hypotheses as follows:

- (**H2a**): CEOs with high equity incentives tend to withhold good information from investors through real earnings management.

- (**H2b**): CEOs with high equity incentives tend to withhold good information from investors through accrual-based earnings management.

We quantify the hypothesis **H2a** by examining the relation between *Delta*-driven real earnings management[2] and R^2_+. Similarly, we quantify the hypothesis **H2b** by exploring the relation between *Delta*-driven accrual-based earnings management[3] and R^2_+. Consequently, hypotheses **H2a** and **H2b** are equivalent to the following:

- (**H2a'**): *Delta*-driven real earnings management is positively associated with R^2_+.

- (**H2b'**): *Delta*-driven accrual-based earnings management is positively associated with R^2_+.

To be parallel with the hypotheses on the channels for good information manipulation, we also explore the channels for CEOs' potential bad information manipulation by hypothesizing the following:

- (**H3a**): CEOs with high equity incentives tend to withhold bad news from investors through real earnings management.

- (**H3b**): CEOs with high equity incentives tend to withhold bad news from investors through accrual-based earnings management.

Withholding firm-specific information from investors definitely distorts the corresponding stock return distribution. On one hand, if CEOs with high incentives are motivated to absorb excess gains (losses) due to temporary good (bad) performance, the supply of firm-specific good (bad) information decreases. The frequency of stock price jump (crash) decreases as the consequence. On the other hand, following a run of sufficiently bad (good) news, CEOs

[2]We measure *Delta*-driven real earnings management by the predicted value of the univariate regression of real earnings management proxies on *Delta*.

[3]We measure *Delta*-driven real earnings management by the predicted value of the univariate regression of discretionary accruals on *Delta*.

may be unable to absorb any more losses (gains). Consequently, the stock price will crash (jump) after the sufficiently bad (good) news goes public. Thus, depending on the timing and the amount of information withheld, the incentivized CEOs' good (bad) information manipulation can either raises or mitigates jump (crash) frequency of stock returns. To test whether *Delta*-driven CEOs' information manipulation raises or mitigates the extreme events in stock returns, we hypothesize the following:

- (**H4a**): CEOs' *Delta*-driven good information manipulation is negatively associated with the lottery-like behavior of stock prices.
- (**H4b**): CEOs' *Delta*-driven bad information manipulation is negatively associated with crash risk.

The above hypotheses explore the impact of incentivized CEOs' one-sided information manipulation on one-sided exposure to jump or crash risk. However, the influence of one-sided information manipulation can have impact on fat-tail distribution generally. For instance, when temporary bad information arrives, CEOs can release to public the good information withheld previously and thus mitigate the stock price crash. To explore whether one-sided information manipulation predicts both stock price lottery-like behavior and crash risk, we hypothesize the following:

- (**H5a**): CEOs' *Delta*-driven good information manipulation is negatively associated with crash risk.
- (**H5b**): CEOs' *Delta*-driven bad information manipulation is negatively associated with the stock lottery-like behavior.

We will now turn to the empirical tests as implied by the five hypotheses presented in this section.

3 Data, Sample, and Summary Statistics

CEO compensation data for the sample period of 1992–2015 are from the Standard&Poor's Execucomp database for firms in the S&P 500, S&P Midcap 400, and S&P Smallcap 600. The stock return and accounting data are from CRSP and COMPUSTAT, respectively. We exclude financial (SIC 6000-6999) and utility (SIC 4900-4999) stocks.

3.1 Measuring Stock Return Informativeness

Our main dependent variables are the measures of the informativeness of stock returns, R^2, positive R^2 (R^2_+) and negative R^2 (R^2_-). We use the R^2 to measure the general informativeness of stock returns. Following Hutton et al. (2009), the R^2s are calculated from the following expanded index model regression in each fiscal year:

$$r_{j,t} = \alpha_j + \beta_{1,j} r_{m,t-1} + \beta_{2,j} r_{i,t-1} + \beta_{3,j} r_{m,t} + \beta_{4,j} r_{i,t} + \beta_{5,j} r_{m,t+1} + \beta_{6,j} r_{i,t+1} + \epsilon_{j,t}, \quad (1)$$

where $r_{j,t}$ is the return on stock j in week t, $r_{m,t}$ is the CRSP value-weighted market index, and $r_{i,t}$ is the Fama and French value-weighted industry index. Consistent with Hutton et al. (2009) and Dimson (1979), we adjust the non-synchronous trading by including lead and lag market and industry returns. [4]

We then define R^2_+ (R^2_-) separately with positive (negative) daily returns. Specifically, in each fiscal year, we calculate R^2_+ by using the same expanded index model regression as Equation (1) but including the return observations in the sample only when they are larger or equal to zero:

$$r_{j,t} | r \geq 0 = \alpha_j + \beta_{1,j} r_{m,t-1} + \beta_{2,j} r_{i,t-1} + \beta_{3,j} r_{m,t} + \beta_{4,j} r_{i,t} + \beta_{5,j} r_{m,t+1} + \beta_{6,j} r_{i,t+1} + \epsilon_{j,t}, \quad (2)$$

[4] Our findings are robust to different models (Fama French three-factor model (Fama and French (1993)) or Carhart (1997) model) and time frequencies (either weekly or monthly).

The R_+^2s can thus capture the informativeness of only positive stock returns. By the same token, R_-^2 is constructed by using the same regression model as Equation (1) but including only negative weekly returns:

$$r_{j,t}|r \leq 0 = \alpha_j + \beta_{1,j} r_{m,t-1} + \beta_{2,j} r_{i,t-1} + \beta_{3,j} r_{m,t} + \beta_{4,j} r_{i,t} + \beta_{5,j} r_{m,t+1} + \beta_{6,j} r_{i,t+1} + \epsilon_{j,t}, \quad (3)$$

Table 1 reports the summary statistics for R^2 measures. Consistent with Roll (1988), R^2 is quite small. The average R^2 ranges from 0.187 to 0.385. The average R_+^2 is smaller than R_-^2 (0.187 VS 0.234). Even though the level of R^2 measures is modest, its cross-sectional variance is relatively huge. The cross-sectional standard deviations of three R^2 measures are all around 0.17. Across three R^2 measures, the average of R^2 is larger than that of R_+^2 and R_-^2. Regarding asymmetric R^2s, the mean of R_+^2 is smaller than that of R_-^2 (0.187 VS 0.235). The significant difference between the average of R_+^2 and that of R_-^2 reveals the asymmetric co-movement of stock returns when encountering good and bad information, consistent with Hong et al. (2000).

The R^2 measures strongly correlate with each other. Table 2 indicates that the correlation between R^2 and R_+^2 and the one between R^2 and R_-^2 are all close to 0.90. Moreover, the correlation between R_+^2 and R_-^2 is 0.73, indicating that firms with less good firm-specific information are also the ones with less bad information.

3.2 Jump and Crash Risk

In line with Hutton et al. (2009), we define the likelihood of positive return jumps and crashes as follows:

- *Crash*: an indicator variable equal to one if within a fiscal year the firm experiences one or more Firm-Specific (residual from the expanded index model in Equation (1)) weekly returns falling 3.09 or more standard deviations below the mean firm-specific Weekly Return for its fiscal year; zero otherwise.

- *Jump*: an indicator variable equal to one if within a fiscal year the firm experience one or more firm-specific (residual from the expanded index model in Equation (1)) weekly returns rising 3.09 or more standard deviations above the mean Firm-Specific Weekly Return for its fiscal year; zero otherwise.

The above definitions of jump and crash risk identify the events of jump and crash by a threshold of 3.09 standard deviations, assuming a standard-normal distribution for firm-specific returns. Given our definition of Jump (Crash), one would expect 0.1% of the sample firms experience jumps (crashes) in any given week. The annualized probability of jump and crash would then be $1 - (1 - 0.001)^{52} = 0.0507$. In Table 2, we observe considerably greater frequency of jumps and crashes than the 0.0507 benchmark. Table 2 indicates that 22.6% of firm-year observations in our sample experience at least one jump in a given year. 19.3% of observations experience at least one crash in a year.

We highlight the correlation matrix in Table 2. Not surprisingly, Jump has a negative correlation with Crash (-0.14). More importantly, we find Jump and Crash are not equivalent to the informativeness of stock returns because the correlation between Jump (Crash) and R^2s are modest. For instance, the correlation between Jump (Crash) and R^2_+ is -0.08 (-0.03). The negative correlation between Jump (Crash) and R^2_+ also reveals a negative association between large shocks and co-movement. These correlations are not counter-intuitive: the informativeness of stock returns counts on the fraction of firm-specific information in the information flow which is not fully determined by large shocks.

3.3 CEOs' Incentives and Characteristics

Our main independent variable is the CEO pay-performance sensitivity (*Delta*). The sensitivity of CEO wealth to stock volatility (*Vega*) is our major control variable. Consistent with Core and Guay (2002), the *Delta* and *Vega* are calculated by using the dividend-adjusted version of the Black and Scholes model for the value of executive stock options. In line with Coles et al. (2006), we also assume that the *Vega* of any stock-holdings, including restricted stock, is zero. The exact definitions of $Delta$ and $Vega$ are as follows:

- $Delta$: The dollar change in CEO wealth associated with a 1% change in the firm's stock price (in \$000s).

- $Vega$: The dollar change in CEO wealth associated with a 1% change in the firm's stock return volatility (in \$000s).

Table 1 reports the summary statistics for CEO incentive measures. The average CEO $Delta$ in our sample is 783.441. On average, a 1% change in the firm's stock price increases the CEO wealth by \$783,441. Regarding CEO $Vega$, a 1% change in the firm's stock return volatility is associated with an average change in CEO wealth of \$179,113. Table 1 also reveals that the median of CEO $Delta$ ($Vega$) is much smaller than its mean, indicating $Delta$ ($Vega$) is positively skewed. In our regression analysis, we use the logarithm of one plus the $Delta$ and that of one plus the $Vega$ to adjust the skewness.

The correlation matrix in Table 2 gives preliminary evidence on our hypotheses. CEO $Delta$ has strong positive correlations with R^2 (0.06) and R^2_+ (0.10). In contrast, the correlation between $Delta$ R^2_- is negligible (0.01). These results are consistent with hypothesis **H1a** but contradicts hypothesis **H1b**. In other words, Table 2 suggests that motivated CEOs withhold good information rather bad information.

Given the strong negative correlation between R^2_+ and Jump (also Crash), we can draw implications on hypotheses **H4a** and **H5a**. That is, the positive correlation between R^2_+ and $Delta$ and the negative association between R^2_+ and Jump indicate a negative impact of incentive-driven good news manipulation on the likelihood of stock price jumps. Similar argument can also be applied to the triangular relation among $Delta$, R^2_-, and Crash, which supports the hypothesis **H5a**.

In our regression analysis, we use two CEOs' characteristics as independent variables, either as instrument variables for $Delta$ or as other controls. Consistent with Palia (2001), Coles et al. (2006) and Brockman et al. (2010), we use age and tenure as the instrumental variables defined as follows:

- *Age*: Logarithm of the CEO age reported in the ExecuComp database.
- *Tenure*: Logarithm of number of years from the first year when the CEO became the CEO of the current company as reported in the ExecuComp database.

When exploring how to mitigate the CEO information manipulation problem, we analyze several CEO characteristics such as CEO tenure and CEO Duration. Beyond the above mentioned *Tenure*, we measure *Duration* following the same approach as in Cohn et al. (2014).

- *Duration*: A value-weighted average number of years of Stock Duration and Option Duration. Stock Duration as the number of years until restricted stock grants awarded in year t vest as reported by ExecuComp. If this variable is missing in ExecuComp, we set Stock Duration equal to three years. We set Option Duration equal to Compustat variable OPTLIFE.

3.4 Identifying Information Manipulation Channels

To identify channels for CEOs to withhold firm-specific information, we use multiple measures for accrual-based earnings management and real earnings management. Following Hutton et al. (2009), we use discretionary accruals to capture the degree of accrual-based earnings management.

- *DiscAcc*: The absolute components of accruals after removing the parts out of the control of the CEO (e.g. Dechow et al. (1995) and Bergstresser and Philippon (2006)). The detail is shown in Appendix A.

Following Roychowdhury (2006) and Zang (2007), we develop three proxies for real earnings management: the abnormal levels of cash flow from operations (CFO), discretionary expenses, and production cost. These three proxies relate to three real earnings manipulation methods.

- The abnormal levels of cash flow from operations capture the acceleration of the timing of sales through increased price discounts or more lenient credit terms.
- The abnromal production cost captures the reporting of lower cost of goods sold through increased production.
- The abnormal discretionary expenses capture the decreases in discretionary expenses which include advertising expense, research and development, and SG&A expenses.

Motivated by the three real earnings management methods, we define the abnormal CFO, the abnormal discretionary expenses, and the abnormal production cost respectively:

- The abnormal CFO (ΔCFO) is the difference between actual CFO and the estimated normal level of CFO. The normal level of CFO is estimated using the regression in the following Equation (4)

$$\frac{CFO_{it}}{Assets_{i,t-1}} = k_1 \frac{1}{Asset_{i,t-1}} + k_2 \frac{Sales_{it}}{Assets_{i,t-1}} + k_3 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + \epsilon_{it}, \tag{4}$$

  where the normal CFO is expressed as a linear function of sales and change in sales.

- The abnormal level of discretionary expense ($\Delta DISX$) is the difference between actual discretionary expense and the estimated normal level of discretionary expenses. The normal level of discretionary expenses is constructed using the following Equation (5)

$$\frac{DiscExp_{it}}{Assets_{i,t-1}} = k_1 \frac{1}{Asset_{i,t-1}} + k_2 \frac{Sales_{i,t-1}}{Assets_{i,t-1}} + \epsilon_{it}, \tag{5}$$

- The abnormal production cost ($\Delta prod$) is the difference between actual production cost and estimated normal production cost. The normal production cost is estimated as follows:

$$\frac{Prod_{it}}{Assets_{i,t-1}} = k_1 \frac{1}{Asset_{i,t-1}} + k_2 \frac{Sales_{it}}{Assets_{i,t-1}} + k_3 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + k_4 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + \epsilon_{it}, \quad (6)$$

Table 2 indicates that all three proxies of real earnings management are positively associated with R^2_+ (from 0.09 to 0.13) but has modest and inconsistent relation with R^2_- (-0.01 to 0.02). Moreover, the real earnings management measures (but not discretionary accrual) are positively related to CEO *Delta*, revealing the stimulation of CEO incentive on their real earnings manipulation behavior. The strong positive correlations across real earnings management measures, *Delta*, and R^2_+ votes for real earnings management as the channel for motivated CEOs to withhold good information (hypothesis **H3a**). The other control variables in our regression analysis are motivated by the variables used in Hutton et al. (2009) and reported in the Appendix B.

4 Empirical Results

In this section, we employ regression analysis to explore the relation between CEO *Delta* incentive and R^2 measures as well as the positive jump risk.

4.1 R^2

Before turning to our main results, which connect *Delta* to our good and bad informativeness measures (R^2_+ and R^2_-), we first confirm the relation between *Delta* incentive and R^2. In contrast to R^2_+ and R^2_-, R^2 captures the general informativeness of stock returns without specifying the direction of the information (good or bad). A strong relation between CEO *Delta* and R^2 can validate our further exploration on R^2_+ and R^2_-.

We explore the relation between *Delta* and R^2 by regressing individual stocks' R^2s in fiscal year $t+1$ on their CEO *Delta* and other control variables in fiscal year t. Models (2) to (5) in Table 3 reports the regressions of R^2 on *Delta* and other control variables under different econometric specifications. The t statistics is computed using robust standard errors clustered at the level of CEOs. In addition to *Delta*, we also control for a range of control variables based on prior research. The variance of returns is mechanically related to R^2: High return volatility increases explained risk and therefore R^2. We also include size, the market-to-book ratio, leverage, and lagged return on equity (ROE) as controls for firm characteristics. Larger firms operating in a wider cross section are expected to have larger co-movement with the market and thus higher R^2. Both leverage and ROE co-move with the market and industry condition and thus are related to the R^2. Furthermore, to be consistent with Jin and Myers (2006), we include return skewness and kurtosis as control variables.

Model (2) in Table 3 shows the relation between *Delta* and R^2 with year and firm fixed effect. As shown in Model (2), the CEO *Delta* has a strong positive impact on the R^2. Based on the coefficient estimates in Model (2) and the summary statistics in Table 1, a one standard deviation shock to *Delta* incentive increases the R^2 by 0.031 ($0.004 \times ln(2481.17)$), which is 8.4% of the median of R^2. Across Models (2) through (5), *Delta* incentive has a significant positive relation with R^2 under different specifications. In other words, firms with high *Delta*-incentivized CEOs tend to have low informativeness in their stock returns.

Some other noteworthy coefficient estimates are also evident in Table 3. First, in Model (1), discretionary accruals (*DisAcc*) is positively associated with R^2, indicating accrual-based earnings management can marginally explain the decrease in informativeness of stock returns. However, when we add *Delta* into the regressions, the explanatory power of *DisAcc* largely disappears. These findings give preliminary evidence that accrual-based earnings management may not be the primary channel to manipulate the informativeness of stock returns. Moreover, across different specifications, the MTB positively predicts R^2, indicating that growth stocks are the ones with low return informativeness.

4.2 R_+^2 *Versus* R_-^2

In this section, we first explore the relation between *Delta* and R_+^2 by regressing R_+^2 in fiscal year $t+1$ on *Delta* in year t. Table 4 reports the corresponding results. We find that *Delta* is positively associated with R_+^2. More importantly, the impact of *Delta* on R_+^2 is even larger than that on R^2. Based on the coefficient estimates in Model (2) and the summary statistics in Table 1, a one standard deviation shock to *Delta* can increase R_+^2 by 0.039 ($0.005 \times ln(2481.17)$), which is 27.1% of the median of R_+^2. Across different econometric specifications, the positive association between *Delta* and R_+^2 is robust, revealing firms with high incentivized CEOs tend to have low informativeness corresponding to their good market performance. These findings strongly support the hypothesis **H1a** that CEOs are motivated to withhold good information from the investors. We also find that the positive relation between *DisAcc* and R_+^2 in Model (1) disappears when we add in *Delta*. This finding indicates that CEOs with high pay–performance incentives are unlikely to use accrual-based method to withhold good news from the perception of investors.

The strong association between *Delta* and R_+^2 can also imply the relation between *Delta* and R_-^2. If the predictive power of *Delta* on R^2 is fixed, a stronger predictive power of *Delta* on R_+^2 indicates that *Delta* has a weaker association with the other half of R^2, the R_-^2. We confirm this argument by regressing R_-^2 on *Delta*. Table 5 reports the corresponding coefficient estimates. Across Model (2) to (4), we find no significant association between *Delta* and R_-^2. The insignificant relation between *Delta* and R_-^2 goes against the hypothesis **H1b**. In sum, the preliminary evidence in this section sheds light on the two questions we ask at the very beginning of this paper. CEOs are incentivized to shelter good information. However, they are not motivated to shroud up bad information.

In contrast to R_+^2, *DisAcc* has a robust positive association with R_-^2 across different model specifications. In other words, to withhold bad information from investors, CEOs with high pay–performance incentives tend to use accrual-based earnings management. What is the tool for motivated CEOs to withhold good information? We answer this question in the next section.

4.3 R^2_+, R^2_-, and Real Earnings Management

As stated in Cohen et al. (2008), CEOs can use not only accrual-based earnings management but also real earnings management to withhold information. The preliminary evidence in previous section reveals that CEOs are not motivated to use discretionary accrual as the earnings manipulation tool. Are they motivated to use real earnings management tools?

We explore the association between real earnings management and R^2_+ by regression R^2_+ in fiscal year $t + 1$ on *Delta*-driven real earnings management measures. As clarified in previous section, we use three proxies for real earnings management: the abnormal CFO (ΔCFO), the abnormal level of discretionary expense ($\Delta DISX$), and the abnormal production cost ($\Delta prod$). We then construct *Delta*-driven real earnings management measures by first regressing three proxies on *Delta* incentive as follows:

$$\Delta CFO_{t+1} = \alpha_0 + \alpha_1 Delta_t + \epsilon_{C,t+1}, \tag{7}$$

$$\Delta DISX_{t+1} = \beta_0 + \beta_1 Delta_t + \epsilon_{D,t+1}, \tag{8}$$

$$\Delta prod = \gamma_0 + \gamma_1 Delta_t + \epsilon_{P,t+1}. \tag{9}$$

In unreported tables, we find *Delta* incentive is positively associated with all three real earnings management proxies. In other words, CEOs are motivated to increase the use of real earnings manipulation tool. This finding also demonstrate the strong association between *Delta* and real earnings management. We then save the correspondent coefficients and get the predicted measures for real earnings management:

$$\Delta \widehat{CFO}_{t+1} = \hat{\alpha}_0 + \hat{\alpha}_1 Delta_t, \tag{10}$$

$$\Delta \widehat{DISX}_{t+1} = \hat{\beta}_0 + \hat{\beta}_1 Delta_t, \tag{11}$$

$$\Delta \widehat{prod}_{t+1} = \hat{\gamma}_0 + \hat{\gamma}_1 Delta_t, \tag{12}$$

where $\Delta\widehat{CFO}_{t+1}$, $\Delta\widehat{DISX}_{t+1}$, and $\Delta\widehat{prod}_{t+1}$ are *Delta*-predicted value of ΔCFO, $\Delta DISX$, and $\Delta prod$ respectively.

Table 6 reports the coefficient estimates of the regressions of R^2_+ on *Delta*-driven real earnings management proxies. The t statistics are adjusted using robust standard errors at the level of CEOs. Models (1) through (3) reveal that $\Delta\widehat{CFO}_{t+1}$, $\Delta\widehat{DISX}_{t+1}$, and $\Delta\widehat{prod}_{t+1}$ are all positively associated with R^2_+. Given the positive relation between *Delta* and real earnings management revealed in Equation (7) through (9), the findings in Table 6 indicate that *Delta* incentive motivate CEOs to increase real earnings management activity in order to shelter good information, consistent with our hypothesis **H2a**. Table 6 also refutes the hypothesis **H3a** by revealing that R^2_- has no association with incentive-driven real earnings manipulation.

We repeat the same procedure to test whether *Delta*-driven discretionary accruals can predict future R^2_+s. In unreported results, we find *Delta*-driven *DisAcc* cannot deviate the positive informativeness of stock returns. That is, CEOs are not motivated to use accrual-based earnings management to withhold good information, contrast to the hypothesis **H2b**. Similarly, we reject the hypothesis **H3b** by finding no association between *Delta*-driven discretionary accruals and R^2_-.

To sum up, the evidence in Table 5 and Table 6 shows that the equity incentives stimulate CEOs to shelter good information through real earnings management but not accrual-based earnings management. In contrast to sheltering good information, withholding bad information has no association with equity incentives. Our findings also reveal that the increase in equity incentives is not associated with increasing accrual-driven bad information manipulation.

4.4 Positive Jump *Versus* Crash

Withholding information changes the magnitude of shocks to the market and thus impacts the fat-tails of stock returns. In this section, we examine the relation between extreme returns and *Delta*-driven information manipulation.

First, we examine whether the one-sided information manipulation driven by equity incentives leads to one-sided exposure to extreme returns. In other words, we test whether incentivized CEOs' good (bad) information withholding behavior influences the lottery-like behavior (crash risk) of stock returns as stated in hypotheses **H4a** and **H4b**.

We explore the relation between incentive-driven good information manipulation and stock lottery-like behavior by performing two regressions. First, we confirm the association between *Delta* and stock lottery-like behavior by regressing Jump in fiscal year $t+1$ on *Delta* in year t. Model (1) in Table 7 reports the corresponding coefficient estimates with t statistics using clustered standard errors at the level of CEOs. The *Delta* has a strong negative association with Jump, indicating that firms with high equity incentives are the ones experiencing fewer positive extreme events.

We then go one step further by examining whether the good news manipulation behavior driven by equity incentives leads to the decrease in Jump. We define the *Delta*-driven good information manipulation by first running univariate regression of R^2_+ on *Delta* and forming the *Delta*-predicted R^2_+. We then test hypothesis **H4a** by regressing Jump on the *Delta*-predicted R^2_+. Model (2) in Table 7 reveals that *Delta*-predicted R^2_+ has a strong negative relation with the stock lottery-like behavior. These findings confirm the hypothesis **H4a** that the good news manipulation by incentivized CEOs leads to fewer positive extreme events of their firms. Similar tests are also provided for the relation between *Delta*-driven R^2_- and Crash. However, we find no supportive evidence for the hypothesis **H4b**.

The findings in Model (2) raise a more interesting question: Does *Delta*-driven R^2_+ predict not only the one-sided exposure to jump but also the other side of exposure to crash? We answer this question by running the regression of Crash on the *Delta*-predicted R^2_+. The coefficient estimates in Model (4) of Table 7 indicates a significantly negative relation between the *Delta*-predicted R^2_+ and Crash. Consistent with our hypothesis **H5a**, the good information manipulation behavior of motivated CEOs results in fewer bad extreme events. In sum, the one-sided information manipulation of incentivized CEOs leads to two-sided exposure to both stock lottery-like behavior and crash risk.

4.5 Preventing CEOs From Sheltering Good Information

We search methods to prevent CEOs from sheltering good information by exploring answers for the following three questions: (i). What type of compensation contracts should be assigned to CEOs? (ii). Can outside supervision prevent motivated CEOs from withholding good information? (iii). Do motivated CEOs hide less information after the passage of the Sarbanes-Oxley Act?

4.5.1 CEOs' Tenure and Duration

It is well documented in recent research that CEOs' characteristics and the design of equity incentive contract impact corporate policies and the CEOs' propensity of earnings management. For instance, CEO's early life experience, tenure, duration and educational background all shape the CEO's financing and investment decisions (e.g., Graham and Harvey (2001); Radhakrishnan et al. (2014)). In other words, exploring the CEOs' background and contracts sheds light on their future good information manipulation behavior.

Specifically, we explore the impact of CEOs' tenure and duration on the empirical link between *Delta* and R^2_+. We introduce two new explanatory variables in the regressions of R^2 measures on *Delta*: the tenure dummy (equal to one if the number of years from the first year when the CEO became the CEO of the current company is longer than the sample median in the year or equal to zero) and the product of *Delta* and tenure dummy. Model (1) through (3) in Table 9 present the coefficient estimates of the regressions of R^2, R^2_+, and R^2_- on *Delta* and control variables, respectively. Even though the *tenure* positively relates to R^2 measures, the interaction term of the *tenure* dummy and *Delta* has a strong negative relation with all R^2 measures. The interaction term indicates that despite having larger *Delta*, the CEOs with longer tenure shelter less good information.

In Model (4) to (6), we introduce another two explanatory variables in the regressions of R^2 measures on *Delta*: the duration dummy (equal to one if the CEOs' duration is larger than the sample median in the year or equal to zero) and the interaction term of *Delta* and the duration dummy. Across Model (4) to (6), the coefficients on duration dummy are insignificant. Of greater interest are the coefficients on the interaction terms of *Delta* and duration dummy. They are all significantly negative, indicating CEOs with high equity incentive but also longer duration tend to shelter less good information.

4.5.2 External Monitors and the R^2_+

Financial analysts and institutional shareholders can serve as external monitors to prevent CEOs from doing earnings management (e.g., Yu (2008)). In this section, we test whether high external supervision can prevent CEOs with high equity incentives from withholding good and bad information.

To examine the impact of external monitors on *Delta*-driven R^2_+, we include two interaction terms as explanatory variables: (i). The product of *Delta* and institutional ownership (IO) dummy, where the IO dummy equals to one when IO in year t is larger than the median IO in year t and equals zero elsewhere; (ii). The product of *Delta* and analyst coverage. In Table 8, Model (1) through (3), we present the coefficient estimates of regressions of R^2 measures on *Delta* and the interaction of *Delta* and IO. The interaction of *Delta* and IO represents the CEOs with high equity incentives and in firms with high institutional ownership. The coefficient estimates on IO dummy in Model (1) through (3) are significantly positive for the regressions of R^2 and R^2_-. In contrast, the interaction term of IO dummy and *Delta* can negatively predicts R^2 and R^2_-. However, the insignificant coefficient on the interaction term in the regression of R^2_+ indicates that institutional ownership cannot help to mitigate the good information manipulation of incentivized CEOs.

In contrast to IO, analyst coverage helps to prevent CEOs with high equity incentives from withholding good information. We present the corresponding evidence in Model (4) through (6) of Table 8. We include the product of *Delta* and analyst coverage to represent the CEOs with both high equity incentives and high analyst coverage. The negative relation between R^2_+ and the interaction term in Model (5) indicates that high analyst coverage tend to prevent CEOs with high *Delta* incentives from withholding good information

4.5.3 Sarbanes-Oxley and the R^2_+

The passage of Sarbanes-Oxley Act significantly increases the penalties for earnings manipulation and consequently reduces the appearance of accrual-based earnings management (e.g., Cohen et al. (2008); Graham et al. (2004); and Hutton et al. (2009);). We examine whether SOX cuts the empirical link between *Delta* and information manipulation by regressing R^2 measures in fiscal year $t+1$ on *Delta* in year t.

In Table 10, Model (1) through (3), we introduce two new explanatory variables: a SOX dummy (equal to zero before 2002 and equal to one in 2002 and beyond) and an interaction term equal to the product of *Delta* and SOX dummy. Even though the SOX dummy has a positive relation with R^2 and R^2_+, the interaction term of SOX and *Delta* is negatively associated with both R^2 and R^2_+. The coefficient on the product of SOX and *Delta* can be interpreted as the change in the coefficient on *Delta* in the post-SOX period. In the regressions of R^2 and R^2_+, the coefficients on the interaction term are both negative and significant at the 1% level. Therefore, the relation between *Delta* and R^2, as well as R^2_+ largely disappears after the passage of SOX. This is consistent with the argument that under greater monitoring, CEOs are less incentivized to shelter good information.

There are two other noteworthy findings in Table 10. First, consistent with previous results, there is no association between *Delta* and R^2_-. Second, even though the coefficient on interaction term is strongly positive, the coefficient on SOX dummy is of even greater statistical and economic significance. In unreported results, we find the strong predictive power of SOX dummy is mainly driven by real earnings management. This finding is consistent with Cohen et al. (2008) that real earnings management, instead of accrual-based earnings management, is prevailing in post-SOX period.

5 Conclusions

This paper demonstrates that CEOs with high pay–performance incentives tend to shelter good information rather than bad information from investors. We also find that incentivized CEOs shelter good information by using real earnings management but not accrual-based earnings management. This one-sided information manipulation of incentivized CEOs decreases their firms' exposure to both stock lottery-like behavior and rare disaster.

Firms can prevent CEOs from sheltering good information by hiring CEOs with longer tenure or designing incentive contract with longer duration. External monitors such as financial analysts or institutional shareholders can also help to mitigate the good news manipulation problem of motivated CEOs.

Appendix A Discretionary Accruals

We define the total accrual as $TA_{i,t} = (\Delta CA_{i,t} - \Delta CL_{i,t} - \Delta Cash_{i,t} + \Delta STD_{i,t} - DEP_{i,t})/A_{i,t-1}$, where $\Delta CA_{i,t}$, the change in the current assets of firm i at time t; $\Delta CL_{i,t}$, the change in current liabilities; $\Delta Cash_{i,t}$, the change in cash holdings; $\Delta STD_{i,t}$, the change in long-term debt in current liabilities; and $DEP_{i,t}$, the depreciation and amortization expense of the firm. $A_{i,t-1}$ is the lagged size (in assets) of firm i at time t-1. Then following Dechow et al. (1995), we also remove components of accruals that are "non-discretionary". We estimate the following model:

$$TA_{i,t} = \alpha_0 + \alpha_1(1/A_{i,t-1}) + \alpha_2(\Delta REV_{i,t}) + \alpha_3(PPE_{i,t}) + \epsilon_{i,t}, \tag{13}$$

$$Discacc_{i,t} = |TA_{i,t} - \hat{\alpha_0} + \hat{\alpha_1}(1/A_{i,t-1}) + \hat{\alpha_2}(\Delta REV_{i,t}) + \hat{\alpha_3}(PPE_{i,t})|, \tag{14}$$

where the $REV_{i,t}$ is the change in sales (normalized by lagged assets) for firm i at time t, and $PPE_{i,t}$ is gross property plant, and equipment, again normalized by firm assets. We then take the absolute of it.

Appendix B Definition of Other Control Variables

- *Size*: The logarithm of the market value of equity at the beginning of fiscal year.
- *MtB*: The ratio of the market value of equity to the book value of equity measured at the beginning of the fiscal year.
- *Lev*: Leverage, the sum of book value of long term debt (DLCQ) and debt in current liabilities (DLTTQ) divided by total assets.
- *ROE*: Contemporaneous return on equity defined as income before extraordinary items divided by the book value of equity.
- *R&D*: Research and development expenditure (XRDQ, replaced by 0 when missing) divided by total assets.
- *svar*: The variance of the weekly returns of the Fama French industry index during the firm fiscal year (Fama and French (1997)).
- *SOX*: An indicator variable equal to one in sample years 2002 and beyond; zero otherwise.
- *Coverage*: Analyst coverage, the logarithm of one plus the number of analysts following a firm during the year.
- *IO*: Institutional ownership, the percentage of stocks held by institutions.
- *SUE*: The difference between realized earnings and median analyst forecast earnings.
- *Skew*: the skewness of the Firm-Specific weekly Return over the fiscal year.
- *Kurt*: the kurtosis of the Firm-Specific weekly Return over the fiscal year.

Table 1: Summary Statistics

This table reports the summary statistics for the main variables of our analysis. Data on executive compensation from 1992 to 2014 are from ExecuComp. R^2 is the R-square from the regression of weekly return on market and industry returns. R^2_+ is R-square using the sample with only positive weekly returns. R^2_- is constructed using the sample with only negative weekly returns. Crash is the indicator variable set equal to one for a firm-year if the firm experiences one or more firm-specific weekly returns falling 3.09 standard deviations below the mean firm-specific return for that fiscal year; otherwise, Crash is set equal to zero. Jump is an indicator variable defined as one if a firm experiences one or more firm-specific weekly return 3.09 standard deviations above the mean value for that fiscal year and zero otherwise. $ln(Tenure)$ is the logarithm of number of years from the first year when the CEO became the CEO of the current company as reported in the ExecuComp database. $ln(age)$ is the natural logarithm of CEO's age. $DisAcc$ is the discretionary accrual. $svar$ is the stock volatility of the last 120 trading days in the previous fiscal year. R&D is the research and development investment. MTB is the market value of assets divided by their book value. Lev is the total debt divided by market value of assets. ROE is the return on equity. Cash is the ratio of cash & equivalent and total assets. Skew is the skewness of the Firm-Specific weekly Return over the fiscal year. Delta and Vega are winsorized at the 1st and 99th percentile levels.

	Mean	std	p25	p50	p75
R^2	0.385	0.174	0.254	0.371	0.511
R^2_+	0.187	0.16	0.062	0.144	0.282
R^2_-	0.234	0.174	0.092	0.2	0.353
Jump	0.226	0.418	0	0	0
Crash	0.193	0.394	0	0	0
	Mean	std	p25	p50	p75
$Delta$	750.44	2481.17	76.656	229.31	650.99
$Vega$	175.189	339.097	15.548	60.576	197.471
$log(tenure)$	1.906	0.758	1.386	1.946	2.398
$log(age)$	4.027	0.134	3.951	4.043	4.111
Duration	1.615	1.681	0.349	1.516	2.388
$DisAcc$	0.125	0.491	0.017	0.046	0.138
$svar$	0.001	0.001	0.0003	0.00009	0.0011
R&D	0.028	0.036	0	0	0.035
ΔCFO	0.041	0.133	0.007	0.047	0.121
$\Delta PROD$	-0.023	0.251	-0.121	-0.036	0.051
$\Delta DISX$	0.012	0.156	-0.103	0.006	0.127
Size	8.237	1.664	7.049	8.096	9.286
MTB	1.787	1.13	1.127	1.418	1.992
Leverage	0.274	0.183	0.144	0.264	0.379
ROE	0.112	0.332	0.065	0.118	0.185
Cash	0.104	0.114	0.024	0.065	0.144
Skew	0.118	0.987	-0.236	0.1	0.465
Kurt	5.487	8.691	1.265	2.609	5.703

Table 2: Correlation Matrix

This table reports the Pearson correlation coefficients of three R^2 measures, $Delta$ & $Vega$, and other control variables. CEO incentive and control variables are at time t. The R^2, R^2_+, and R^2_- are in fiscal year $t+1$. CEO $Delta$ and $Vega$, R^2 measures, and all ratio variables are winsorized at the 1st and 99th percentiles.

	R2	R2+	R2-	Jump	Crash	Delta	Vega
R^2	1						
R^2_+	0.88	1					
R^2_-	0.89	0.73	1				
Jump	-0.09	-0.08	-0.03	1			
Crash	-0.11	0.01	-0.13	-0.14	1		
$Delta$	0.01	0.02	0.01	0.00	-0.01	1	
$Vega$	0.02	0.05	0.01	-0.02	0.01	0.50	1
$log(tenure)$	0.00	0.00	0.00	0.01	0.00	0.10	0.09
$log(age)$	0.05	0.04	0.04	-0.02	-0.01	0.07	0.09
Duration	0.26	0.25	0.26	0.00	0.03	0.04	0.21
$DisAcc$	0.00	-0.01	0.01	-0.02	0.02	-0.01	0.01
$svar$	0.43	0.49	0.43	0.13	0.04	0.00	-0.05
R&D	-0.06	-0.06	-0.06	0.03	-0.01	0.04	0.08
ΔCFO	0.02	0.09	0.01	-0.03	-0.05	0.05	-0.02
$\Delta PROD$	0.04	0.12	-0.01	-0.05	-0.07	0.09	-0.01
$\Delta DISX$	0.03	0.13	0.02	-0.03	-0.04	0.07	-0.02
$svar$	0.23	0.24	0.22	-0.06	-0.02	0.09	0.41
MTB	-0.14	-0.09	-0.12	0.01	0.04	0.09	0.10
Leverage	-0.08	-0.07	-0.05	-0.01	0.00	-0.01	0.01
ROE	-0.04	-0.02	-0.03	0.00	0.03	0.01	0.07
Cash	-0.04	-0.04	-0.04	0.04	-0.02	0.09	0.04
Skew	-0.01	-0.08	0.11	0.35	-0.34	0.00	-0.02
Kurt	-0.39	-0.26	-0.28	0.23	0.25	0.00	-0.01

Table 3: R^2

This table presents the coefficient estimates of R^2 in fiscal year $t+1$ on the CEO *Delta* and other control variables in fiscal year t. Models (1), (2), (4), and (5) refer to the regressions including in both firm fixed effect and year fixed effect. Model (3) refers to the regression including in both industry fixed effect and year fixed effect. All independent variables are defined in Table 1. t-Statistics are in parentheses below parameter estimates. The t-statistics for Models (1)–(5) are based on clustered standard errors at the level of CEOs. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Delta		0.004	0.002	0.005	0.006
		(3.41)***	(2.71)***	(3.91)***	(3.08)***
Vega		-0.002	-0.002	-0.001	-0.002
		(-1.77)*	(-2.89)***	(-1.55)	(-1.19)
DisAcc	0.003		0.002	0.002	0.002
	(2.81)***		(1.53)	(1.69)*	(1.65)
svar	74.03	68.025	86.022	73.96	71.589
	(15.42)***	(13.71)***	(15.53)***	(14.74)***	(14.02)***
Size	0.012	0.011	0.024	0.011	0.011
	(5.74)***	(4.87)***	(7.61)***	(4.54)***	(4.61)***
MTB	0.011	0.009	0.007	0.008	0.009
	(9.91)***	(7.95)***	(8.66)***	(7.88)***	(9.12)***
Lev	-0.043	-0.039	-0.072	-0.039	-0.045
	(-5.59)***	(-4.83)***	(-13.41)***	(-4.79)***	(-5.33)***
ROE	0.004	0.005	0.001	0.004	0.005
	(2.02)**	(2.24)**	(0.15)	(2.03)**	(2.09)**
Skew	-0.002	-0.001	-0.001	-0.002	-0.002
	(-1.86)*	(-1.71)*	(-0.43)	(-1.85)*	(-2.34)**
Kurt	-0.004	-0.004	-0.005	-0.004	-0.004
	(-3.30)***	(-3.90)***	(-4.40)***	(-3.88)***	(-3.05)***
Ind Fixed Effect	No	No	Yes	No	No
Firm Fixed Effect	Yes	Yes	No	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
obs	19,560	19,560	19,560	19,560	19,560
R^2	79.1	79.2	57.5	79.6	79.7

Table 4: R^2_+

This table presents the coefficient estimates of R^2_+ in fiscal year $t+1$ on the CEO *Delta* and other control variables in fiscal year t. Models (1), (2), (4) refer to the regressions including in both firm fixed effect and year fixed effect. Model (3) refers to the regression including in both industry fixed effect and year fixed effect. All independent variables are defined in Table 1. t-Statistics are in parentheses below parameter estimates. The t-statistics for Models (1)–(4) are based on clustered standard errors at the level of CEOs. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.

	(1)	(2)	(3)	(4)
log(Delta)		0.005	0.003	0.005
		(6.92)***	(5.88)***	(7.62)***
log(Vega)		-0.001	-0.001	-0.001
		(-0.76)	(-2.03)**	(-0.65)
Dis_accrual	0.001		0.001	0.001
	(0.81)		(0.97)	(0.91)
svar	65.606	62.118	74.272	66.707
	(14.02)***	(12.75)***	(14.45)***	(13.55)***
log_firmsize	0.011	0.009	0.017	0.009
	(5.54)***	(4.19)***	(24.55)***	(3.86)***
MTB	0.011	0.009	0.006	0.009
	(11.46)***	(8.70)***	(9.02)***	(8.06)***
leverage	-0.041	-0.034	-0.056	-0.033
	(-5.48)***	(-4.24)***	(-11.16)***	(-4.15)***
ROE	0.003	0.004	0.001	0.003
	(-1.63)	(-1.65)	(-0.11)	(-1.49)
Skew	-0.01	-0.01	-0.009	-0.01
	(-12.13)***	(-12.26)***	(-11.03)***	(-12.15)***
Kurt	-0.002	-0.002	-0.002	-0.002
	(-18.19)***	(-18.67)***	(-21.48)***	(-17.53)***
Ind fixed effect	No	No	Yes	No
Firm fixed effect	Yes	Yes	No	Yes
Year dummy	Yes	Yes	Yes	Yes
obs	19,560	19,560	19,560	19,560
R^2	68.9	70.1	50.7	69.7

Table 5: $R^2\_$

This table presents the coefficient estimates of $R^2\_$ in fiscal year $t+1$ on the CEO *Delta* and other control variables in fiscal year t. Models (1), (2), (4) refer to the regressions including in both firm fixed effect and year fixed effect. Model (3) refers to the regression including in both industry fixed effect and year fixed effect. All independent variables are defined in Table 1. t-Statistics are in parentheses below parameter estimates. The t-statistics for Models (1)–(4) are based on clustered standard errors at the level of CEOs. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.

	(1)	(2)	(3)	(4)
log_delta		0.001	0.001	0.001
		(0.95)	(1.56)	(0.59)
log_vega		-0.001	-0.001	-0.001
		(-1.24)	(-1.93)	(-1.17)
dis_accrual	0.003		0.003	0.003
	(2.30)**		(1.86)*	(2.41)**
svar	68.489	66.657	81.149	70.659
	(13.24)***	(12.37)***	(14.37)***	(12.96)***
log_firmsize	0.007	0.007	0.019	0.007
	(3.04)***	(2.90)***	(24.76)***	(2.69)***
MTB	0.005	0.005	0.003	0.005
	(4.47)***	(4.05)***	(4.17)***	(3.89)***
leverage	-0.027	-0.025	-0.049	-0.025
	(-3.20)***	(-2.88)***	(-8.88)***	(-2.78)***
roe	0.001	0.001	-0.002	0.001
	(0.31)	(0.51)	(-0.79)	(0.35)
skewn	0.014	0.014	0.015	0.014
	(15.68)***	(15.34)***	(16.08)***	(14.82)***
kur	-0.002	-0.002	-0.003	-0.002
	(-21.65)***	(-21.57)***	(-24.90)***	(-20.60)***
Industry Fixed Effect	No	No	Yes	No
Firm Fixed Effect	Yes	Yes	No	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
obs	19,560	19,560	19,560	19,560
R^2	68.5	68.7	50.2	69.1

Table 6: R^2_+, R^2_-, and *Delta*-Driven Real Earnings Management

This table presents the coefficient estimates of the regressions of R^2_+ and R^2_- in fiscal year $t+1$ on the *Delta*-driven real earnings managment measures and other control variables in fiscal year t. Models (1)–(3) refer to the regressions including in abnormal CFO (ΔCFO), the abnormal level of discretionary expenses ($\Delta DISX$), and the abnormal production cost ($\Delta prod$) as control variables, respectively. All independent variables are defined in Table 1. t-Statistics are in parentheses below parameter estimates. The t-statistics for Models (1)–(4) are based on clustered standard errors at the level of CEOs. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.

	(1)		(2)		(3)	
	R^2_+	R^2_-	R^2_+	R^2_-	R^2_+	R^2_-
$\widehat{\Delta CFO}$	20.514	-2.849				
	(6.32)***	(-0.59)				
$\widehat{\Delta DISX}$			12.666	-1.759		
			(4.71)***	(-0.59)		
$\widehat{\Delta prod}$					1.261	0.121
					(4.55)***	(0.50)
log(Vega)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.65)	(-1.17)	(-0.65)	(-1.17)	(-0.52)	(-1.01)
dis_accrual	0.001	0.003	0.001	0.003	0.001	0.003
	(0.91)	(2.41)**	(0.91)	(2.41)**	(0.94)	(2.37)**
svar	66.707	70.659	66.707	70.659	66.807	70.329
	(13.55)***	(12.96)***	(13.55)***	(12.96)***	(13.56)***	(12.88)***
Size	0.009	0.007	0.009	0.007	0.008	0.006
	(3.86)***	(2.65)***	(3.86)***	(2.65)***	(3.73)***	(2.63)***
MTB	0.009	0.005	0.009	0.005	0.009	0.005
	(8.61)***	(3.89)***	(8.61)***	(3.89)***	(8.62)***	(3.96)***
Lev	-0.033	-0.025	-0.033	-0.025	-0.033	-0.025
	(-4.15)***	(-2.78)***	(-4.15)***	(-2.78)***	(-4.17)***	(-2.81)***
ROE	0.003	0.001	0.003	0.001	0.003	0.001
	(1.49)	(0.35)	(1.49)	(0.35)	(1.53)	(0.37)
Skew	-0.011	0.014	-0.011	0.014	-0.011	0.014
	(-12.15)***	(14.82)***	(-12.15)***	(14.82)***	(-12.31)***	(14.62)***
Kurt	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(-17.53)***	(-20.61)***	(-17.53)***	(-20.61)***	(-17.46)***	(-20.62)***
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
obs	19,560	19,560	19,560	19,560	19,560	19,560
R^2	60.2	53.5	61.3	67.8	55.1	52.5

Table 7: Jump and Crash Predictability

This table presents the coefficient estimates of the regressions of Jump and Crash in fiscal year $t+1$ on the *Delta*-driven R^2 measures and other control variables in fiscal year t. Models (1)–(2) refer to the regressions of Jump and Crash on *Delta*. Models (3)–(4) refer to the regressions of Jump and Crash on the *Delta*-driven R^2_+. All independent variables are defined in Table 1. t-Statistics are in parentheses below parameter estimates. Models (1)–(4) include both firm fixed effect and year fixed effect. The t-statistics for Models (1)–(4) are based on clustered standard errors at the level of CEOs. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.

	(1)	(2)		(3)	(4)
	Jump	Crash		Jump	Crash
log(Delta)	-0.072***	-0.064***	$\widehat{R^2_+}(Delta)$	-0.791***	-1.648***
	(-7.52)	(-6.33)		(-8.71)	(-3.25)
log(Vega)	0.056***	0.044***	log(Vega)	0.011	0.032**
	(5.38)	(4.16)		(1.37)	(2.26)
dis_accrual	0.025	0.005	dis_accrual	-0.021	-0.009
	(0.82)	(0.77)		(-0.45)	(0.78)
Size	-0.207***	0.193***	Size	-0.082***	-0.007
	(-5.72)	(3.92)		(-6.22)	(0.97)
MTB	-0.098***	0.108***	MTB	-0.021***	0.037**
	(-7.15)	(7.21)		(-4.18)	(2.32)
Lev	0.281**	-0.174	Lev	0.0790	0.021
	(2.08)	(-1.09)		(1.61)	(0.87)
ROE	0.002	-0.192***	ROE	-0.0295	0.085*
	(1.13)	(-3.75)		(1.26)	(1.73)

Table 8: Interaction with Institutional Holding and Analyst Coverage

This table presents the coefficient estimates of the regressions of R^2 measures in fiscal year $t+1$ on the *Delta*, measures for external monitors, and other control variables in fiscal year t. *IO* represents the institutional ownership. *Dummy*(*IO*) is the indicator variable which equals to one when the *IO* observation for firm i in fiscal year t is larger than the sample median of *IO* in year t and equals to zero elsewhere. The $Delta \times IO$ is the product of *Delta* and the *IO* dummy. *Coverage* represents the analyst coverage. *Dummy*(*Coverage*) is the indicator variable which equals to one when the *Coverage* observation for firm i in fiscal year t is larger than the sample median of *Coverage* in year t and equals to zero elsewhere. All other independent variables are defined in Table 1. t-Statistics are in parentheses below parameter estimates. Models (1)–(6) include both firm fixed effect and year fixed effect. The t-statistics for Models (1)–(6) are based on clustered standard errors at the level of CEOs. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.

	R^2	R^2_+	R^2_-	R^2	R^2_+	R^2_-
$Delta \times Dummy(IO)$	-0.004***	-0.002	-0.005***			
	(-3.15)	(-1.43)	(-3.32)			
$Dummy(IO)$	0.028	0.012	0.028***			
	(3.50)***	(1.49)	(3.16)			
$Delta \times Dummy(Coverage)$				-0.002**	-0.002**	-0.001***
				(-2.56)	(-2.46)	(-2.51)
$Dummy(Coverage)$				0.005	-0.013	-0.001
				(0.61)	(-1.52)	(-0.13)
Delta	0.005***	0.006***	0.003**	0.004***	0.005***	0.001
	(3.96)	(4.85)	(2.04)	(3.30)	(4.31)	(0.84)
Vega	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-1.47)	(-0.62)	(-1.10)	(-1.54)	(-0.66)	(-1.17)
DisAcc	0.002*	0.001	0.003**	0.002*	0.001	0.003**
	(1.84)	(0.92)	(2.41)	(1.78)	(0.93)	(2.38)
svar	73.893***	66.661***	70.48***	74.19***	66.679***	70.81***
	(14.73)	(13.54)	(12.93)	(14.79)	(13.55)	(12.98)
Size	0.011***	0.009***	0.007***	0.011***	0.009***	0.007***
	(4.60)	(3.89)	(2.71)	(4.99)	(3.85)	(2.96)
MTB	0.009***	0.009***	0.005***	0.009***	0.009***	0.005***
	(7.91)	(8.61)	(3.92)	(8.16)	(8.54)	(4.06)
lev	-0.038***	-0.033***	-0.024***	-0.04***	-0.033***	-0.025***
	(-4.72)	(-4.13)	(-2.74)	(-4.88)	(-4.16)	(-2.85)
ROE	0.004**	0.003	0.001	0.004*	0.003	0.001
	(1.99)*	(1.48)	(0.33)	(1.95)	(1.52)	(0.31)
Skew	-0.002*	-0.010***	0.014***	-0.002*	-0.010***	0.014***
	(-1.87)	(-12.15)	(14.83)	(-1.85)	(-12.18)	(14.81)
Kurt	-0.004***	-0.002***	-0.002***	-0.004***	-0.002***	-0.002***
	(-37.85)	(-17.51)	(-20.58)	(-37.93)	(-17.53)	(-20.63)
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
obs	19,560	19,560	19,560	19,560	19,560	19,560
R^2	79.7	68.9	68.6	79.9	69.1	68.5

Table 9: Interaction with Tenure and Duration

This table presents the coefficient estimates of the regressions of R^2 measures in fiscal year $t+1$ on the *Delta*, measures for CEO tenure and the *Duration*, and other control variables in fiscal year t. *Tenure* represents the number of years from the first year when the CEO became the CEO of the current company. *Dummy*(*Tenure*) is the indicator variable which equals to one when the *Tenure* observation for firm i in fiscal year t is larger than the sample median of *Tenure* in year t and equals to zero elsewhere. The $Delta \times Dummy(Tenure)$ is the product of *Delta* and the *Tenure* dummy. *Duration* represents the duration of the incentive contract. *Dummy*(*Duration*) is the indicator variable which equals to one when the *Duration* observation for firm i in fiscal year t is larger than the sample median of *Duration* in year t and equals to zero elsewhere. All other independent variables are defined in Table 1. t-Statistics are in parentheses below parameter estimates. Models (1)–(6) include both firm fixed effect and year fixed effect. The t-statistics for Models (1)–(6) are based on clustered standard errors at the level of CEOs. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
$Delta \times Tenure$	-0.005***	-0.003***	-0.004***			
	(-3.55)	(-2.64)	(-2.96)			
Dummy(Tenure)	0.021***	0.001	0.017**			
	(2.78)	(0.21)	(2.07)			
$Delta \times Duration$				-0.004**	-0.005***	-0.006***
				(-2.54)	(-2.71)	(-2.96)
Dummy(Duration)				0.263	0.362	0.361
				(0.83)	(1.11)	(0.92)
Delta	0.004***	0.005***	0.001***	0.004**	0.006***	0.003*
	(3.35)	(4.35)	(1.03)	(2.53)	(2.76)	(1.93)
Vega	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001
	(-1.48)	(-0.69)	(-1.16)	(-0.63)	(-0.83)	(-0.25)
dis_accrual	0.002*	0.001	0.003**	0.004***	0.002	0.005***
	(1.86)	(0.92)	(2.43)	(2.80)	(1.52)	(2.79)
svar	73.762***	66.619***	70.433***	38.476***	53.669***	51.997***
	(14.71)	(13.54)	(12.92)	(5.63)	(6.88)	(6.14)
Size	0.011***	0.009***	0.007***	0.016***	0.005	0.005***
	(4.61)	(3.91)	(2.74)	(2.81)	(0.72)	(2.89)
MTB	0.008***	0.009***	0.005***	0.005*	0.009***	0.005**
	(7.82)	(8.61)	(3.87)	(1.75)	(2.91)	(2.37)
Lev	-0.039***	-0.033***	-0.024***	-0.016*	-0.031***	-0.012*
	(-4.76)	(-4.13)	(-2.74)	(-1.93)	(-2.61)	(-1.69)
ROE	0.004**	0.003	0.001	0.005*	0.003	0.002
	(2.01)	(1.49)	(0.34)	(1.77)	(1.00)	(0.51)
Skew	-0.002***	-0.010***	0.014***	-0.002	-0.015***	0.021***
	(-1.81)	(-12.14)	(14.87)	(-1.47)	(-9.31)	(11.93)
Kurt	-0.004***	-0.002***	-0.002***	-0.005***	-0.002***	-0.003***
	(-37.94)	(-17.54)	(-20.65)	(-26.69)	(-11.19)	(-14.48)
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
obs	19,560	19,560	19,560	7,983	7,983	7,983
R^2	79.6	68.7	68.9	79.7	69.2	68.8

Table 10: Relation Between *Delta* and R^2 Measures Pre- and Post-Sarbanes-Oxley Act

This table presents the coefficient estimates of the regressions of R^2 measures in fiscal year $t+1$ on the *Delta*, *SOX* dummy, and other control variables in fiscal year t. *SOX* is an indicator variable equal to one in 2002 and beyond and equal to zero otherwise. $Delta \times SOX$ is the interaction term of *Delta* and *SOX* dummy. All other independent variables are defined in Table 1. t-Statistics are in parentheses below parameter estimates. Models (1)–(6) include both firm fixed effect and year fixed effect. The t-statistics for Models (1)–(6) are based on clustered standard errors at the level of CEOs. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.

	R2	R2+	R2-
$Delta \times SOX$	-0.005**	-0.005	-0.001
	(-2.28)	(-3.53)**	(-1.17)
SOX	0.239***	0.098	0.141
	(26.93)	(11.94)***	(14.73)***
Delta	0.007***	0.008	0.003
	(4.27)	(4.50)***	(1.41)
Vega	-0.001	-0.001	-0.007
	(-0.21)	(-0.040)	(-5.50)***
dis_accrual	-0.002*	-0.003	-0.004
	(-1.87)	(-2.09)**	(-2.48)**
svar	189.522	207.171	177.582
	(53.34)***	(63.00)***	(46.71)***
Size	0.054	0.039	0.037
	(21.34)***	(16.52)***	(13.48)***
MTB	0.008	0.008	0.003
	(5.60)***	(6.01)***	(2.16)**
Lev	-0.048	-0.038	-0.053
	(-4.65)***	(-3.97)***	(-4.85)***
ROE	0.001	0.001	-0.004
	(0.49)	(0.39)	(-1.31)
Skew	-0.005	-0.013	0.011
	(-4.87)***	(-12.43)***	(8.99)***
Kurt	-0.005	-0.002	-0.003
	(-34.48)***	(-19.21)***	(-21.36)***
Firm Fixed Effect	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
obs	19,560	19,560	19,560
R^2	80.1	69.2	68.9

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