Out-of-equilibrium CEO Incentives, Dynamic Adjustment and Financial Misreporting*

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Abstract

The objective of this paper is to investigate (1) the role of adjustment costs in sustaining divergence between actual and optimal CEO equity incentives; (2) the nature of the dynamic process governing adjustment of non-optimal incentives back towards optimal; and (3) the extent to which deviations from optimal incentives exacerbate financial misreporting. Consistent with adjustment costs driving a wedge between realized and optimal incentives, we document that firm value decreases in deviations from optimal, and that firms only partially close the current gap between target and actual CEO incentives over the subsequent year. Further, speed of adjustment towards optimality varies with differences in monitoring intensity, product market competition and CEO tenure. Examining consequences of out-of-equilibrium incentives, we find that financial misreporting is increasing in the deviation from optimal, where the sensitivity of misreporting to deviation is stronger when CEO incentives are excessive relative to when they are below optimal levels. Finally, the sensitivity of misreporting to deviation is lower for firms with higher monitoring intensity, and magnified for firms with more intense product market competition and early term CEOs.

1. Introduction

A large empirical literature examines relations between CEOs' incentives and decision outcomes such as firm performance and earnings management.[1] However, significant challenges hinder the interpretation of empirical associations between decision outcomes and observed CEO incentives. Specifically, such empirical associations can be interpreted as reflecting either an in-equilibrium or out-of-equilibrium phenomenon (e.g., Hermalin and Weisbach, 2003). The two interpretations have very different implications for compensation policy. First, if observed incentives continuously reflect optimal equilibrium choices, there should be no systematic relation between CEO incentives and firm outcomes, implying that any empirical association is results from correlated omitted variables (e.g., Demsetz, 1983; Himmelberg et al., 1999). In contrast, an out-of-equilibrium interpretation construes empirical associations between incentives and outcomes as reflecting sub-optimal actions by executives that can be remedied by better incentive alignment.

Empirically differentiating these two interpretations requires a plausible theory for why out-of-equilibrium incentives could persist given negative consequences for shareholders. Core et al. (2003) and Core and Larcker (2002) argue that a persistent wedge between observed and optimal incentives can result from the presence of adjustment costs associated with realigning suboptimal incentives. Non-trivial adjustment costs constrain firms' ability to quickly restore optimal incentives, resulting in sustained deviations from optimal which negatively influence managerial decisions (e.g., Morck et al., 1988). In contrast, an equilibrium interpretation presumes that there are no frictions impeding firms' ability to continuously adjust incentives to optimal levels (e.g., Demsetz and Lehn, 1985).

[1] Useful reviews of this literature include Edmans et al. (2017), Armstrong et al. (2010), and Core et al. (2003).

In this paper we take an explicit out-of-equilibrium perspective in which adjustment cost frictions constrain value maximizing firms achieving optimal CEO incentive levels.[2] Our first objective is to investigate both the role of adjustment costs in sustaining divergence between actual and optimal CEO equity incentives and the nature of the dynamic process governing adjustment of non-optimal incentives back towards optimal. Consistent with adjustment costs driving a wedge between realized and optimal incentives, we document that firm value decreases in estimated deviations from optimal. Further, we find that while firms actively seek to restore optimality, they are unable to fully close the current gap between target and actual CEO incentives over the subsequent year. The speed of adjustment towards optimality is relatively faster when actual incentives are below target and varies across firms with differences in monitoring intensity, product market competition and CEO tenure.

Our second objective is to explore the extent to which deviations from optimal incentives exacerbate financial misreporting.[3] While theory suggests that in-equilibrium earnings management can be associated with an optimal second best contract (e.g., Dye, 1988; Evans and Sridhar, 1996; Goldman and Slezak, 2006), we seek to isolate any out-of-equilibrium component of misreporting associated with suboptimal incentives. We document a significant positive association between financial misreporting and deviations from optimal, where the sensitivity of misreporting to deviation is stronger when CEO incentives are excessive relative to when they are below optimal levels. In addition, the sensitivity of misreporting to deviations from optimal is

[2] We use the term incentives to refer to pay performance sensitivity as captured by a CEO's equity portfolio delta (i.e., change in CEO wealth per 1% change in firm value). Equity portfolios also embed risk-taking incentives captured by vega (change in CEO wealth per 1% change in stock price volatility). While risk-taking incentives are not our focus, we control for CEO vega in our financial misreporting analyses (e.g., Armstrong et al., 2013).

[3] We use the terms financial misreporting and earnings management interchangeably to refer to both earnings management as well as fraudulent misreporting of accounting numbers.

lower for firms with higher monitoring intensity, and magnified for firms with more intense product market competition and early term CEOs.

To measure deviations from optimal, we estimate a model of CEO pay performance sensitivity using an extensive set of time varying firm and CEO characteristics to capture changes in target incentives over time, as well as firm fixed effects to capture time invariant aspects of target incentives. Then, following Core and Guay (1999) and others, we posit that residuals from this model represent deviations from optimal CEO incentives.[4] We perform a series of analyses to provide evidence that these residuals plausibly reflect deviations from optimal incentive levels.

First, if optimal incentives are designed to maximize firm value, then deviations from optimal should degrade firm performance. To examine this proposition, we estimate the association between future Tobin's Q and residuals from our estimation of target incentives. To the extent that these residuals reflect deviations from optimal, we expect Q to be lower for both positive and negative residuals. Consistent with this, we find that Q is increasing in the incentive residual when CEO delta is too low (negative residuals) and decreasing when it is too high (positive residuals).[5]

Building on this result, we expect firms to actively pursue restoration of optimality subject to an adjustment costs that inhibit the speed with which firms are able to restore optimality. CEOs' equity incentives can become misaligned due to changes in firm and manager characteristics, periodic rebalancing of equity portfolios by executives, and changes in stock price, price volatility and time to maturity. Consistent with boards readjusting misaligned incentives back towards

[4] Papers that have taken related approaches to measuring deviations from optimal incentives include Core et al. (1999), Burns and Kedia (2006), Tong (2008), Bushman et al. (2016a) and Peng et al. (2016).
[5] Tong (2008) and Peng et al. (2016) run related analyses using different specifications.

optimality, Core and Guay (1999) find that the incentives reflected in future equity grants are negatively related to deviations from optimality.

Our point of departure for examining dynamic adjustment of CEO incentives is an extension of Core and Guay (1999) utilizing an augmented model of optimal incentives and a significantly longer sample period. Reaffirming Core and Guay (1999), we find that incentive levels reflected in future equity grants to CEOs are negatively related to estimated deviations from optimal. However, while these results suggest active management of incentive towards optimality, this empirical specification does not provide insight into the nature of adjustment costs and out-of-equilibrium incentives. First, this specification focuses only on equity grants, while Li (2002) notes that restoring optimality involves both firms' equity granting decisions and CEOs' portfolio decisions. Second, and most pertinent to our objectives, this specification provides no information on the extent to which optimal incentives are fully restored or on properties of the dynamic adjustment process if they are not.

To address these challenges, we examine the hypothesis that if adjustment costs constrain firm's ability to quickly remedy misaligned incentives, then incentives will only partially adjust back to optimal levels. We empirically isolate the speed of partial adjustment by estimating the proportion of any existing gap between target and actual incentives that is closed over the subsequent year by virtue of changes in incentives deriving from any and all sources.[6] This analysis documents that on average firms close around 43% of the gap between target and actual incentives over the subsequent year. Disaggregating the gap, we find that 50% (37%) of the gap is closed for positive (negative) gaps, suggesting that it is easier to increase incentives that are too

[6] The process of restoring incentive alignment involves firms' equity granting decisions as well as decisions by CEOs to exercise options and buy or sell shares (Li (2002). Our approach considers the combined effect of all such decisions on CEO incentives. The technique of partial speed of adjustment has been widely used in the finance literature to examine capital structure adjustments (e.g., Lemmon et al. 2008; Flannery and Rangan 2006).

low relative to decreasing incentives that are too high.[7] We further conjecture that speed of adjustment will vary with the extent of (1) monitoring intensity as captured by institutional ownership, equity analyst following and board structure; (2) product market competition, as competitive pressure can impose discipline on firms to remove slack; and (3) the tenure of the CEO, as the consequences of suboptimal portfolio incentives may be amplified by career concerns of newer CEOs managing perceptions of their talent, putting a premium on faster incentive adjustment. We find that speed of adjustment is significantly faster for higher levels of all three measures of monitoring intensity, more intense product market competition and CEOs early in their tenure.

Our final analyses explore consequences of deviations from optimal CEO incentives for financial misreporting. An extensive literature examines relations between managerial equity incentives and misreporting with mixed results.[8] But as discussed earlier, this literature is plagued by fundamental interpretation issues due to endogeneity and whether observed incentives represent in- or out-of-equilibrium structures. We extend the literature by adopting an explicit out-of-equilibrium perspective on CEO incentives and investigating the extent to which deviations from optimality are associated with financial misreporting. We proxy for misreporting using both performance matched discretionary accruals and AAERs (SEC Accounting and Auditing Enforcement Releases), and again use residuals from our estimation of target incentives to capture deviations from optimal. We find that financial misreporting is positively associated with deviations from optimal. Further, this relation exhibits a fundamental asymmetry in which the

[7] When gap = (target incentives – actual incentives) > 0, incentives must be increased to meet target and vice versa for negative gaps.

[8] Much of this literature is based on the premise that when their wealth is more sensitive to changes in stock price, managers benefit more from misreporting that increases stock price. An implicit assumption is that benefits from misreporting dominate any risks associated with misreporting (Armstrong et al., 2013).

sensitivity of misreporting to deviations from optimal is significantly stronger when CEO incentive levels are excessive relative to when they are too low. These results are robust to controlling for estimates of deviations of a CEO's portfolio vega from optimal levels (Armstrong et al., 2013).

In cross-sectional analysis, we find that the sensitivity of misreporting to deviations from optimal is *lower* for firms with higher institutional ownership, greater analyst following and more independent boards, and *higher* for firms with higher product market competition and early tenure CEOs. These effects are all more pronounced when incentive levels are excessive relative to when they are too low. These results are consistent with the greater monitoring discipline associated with institutional ownership, analysts and board independence counter-balancing incentive misalignment. With respect to higher product market competition and CEO's early in their tenure, previous literature provides evidence that firms facing higher competition engage in more earnings management (e.g., Markarian and Santalo, 2014; Bushman, et al., 2016), as do CEOs early in their tenure (e.g., Ali and Zhang, 2015). Our results are consistent with the influence of suboptimal equity incentives on financial misreporting being intensified by higher product market competition and career concerns. This heightened influence may help explain our earlier result that competition and career concerns are associated with faster speed of adjustment.

Our explicit analyses of out-of-equilibrium CEO incentives in this paper make several substantive contributions to the executive compensation literature. First, we provide new evidence on the importance of adjustment costs in sustaining divergence between actual and optimal CEO equity incentives. Specifically, we extend Core and Guay (1999) and Li (2002) by documenting that, not only do firms actively use equity grants manage shocks to incentives back towards optimality, but that deviations from optimal are negatively associated with firm value. These negative effects on firm value suggest that the active management of incentives we document is unable to fully remedy out-of-equilibrium incentives.

Building on this observation, we also extend the literature by implementing an in-depth investigation into properties of the dynamic process reflecting firms' active efforts to restore optimality (see e.g., Cheung and Wei, 2006; Tong 2008; Bushman et al., 2016a). Our speed of partial adjustment analysis provides several novel insights into the trajectory of incentive adjustment over time. First, we provide evidence of asymmetry in the adjustment trajectory, where incentives converge towards optimal more quickly when target incentives exceed actual, consistent with it being easier to remedy incentives that are too low than to decrease excessive incentives. Second, our cross-sectional analyses provide new evidence that there is significant variation in the speed of adjustment associated with differences in monitoring intensity, competitive pressure and CEO career concerns.

We also extend the literature by exploring implications of adjustment costs for financial misreporting. While a large literature examines relations between CEO incentives and misreporting, our explicit emphasis on adjustment costs provides a new perspective on this issue. We document evidence consistent with there being an out-of-equilibrium component of misreporting associated with deviations from optimal incentives.[9] Second, we shed new light on the nature of financial misreporting by revealing an asymmetry in which the sensitivity of misreporting to deviations from optimality is significantly stronger for excessive relative to inadequate incentive levels. Finally, we provide new evidence on cross-sectional differences in the sensitivity of misreporting to deviations from optimal related to monitoring intensity, product market competition and CEO tenure.

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[9] Without explicitly considering the distinction between in- and out-of-equilibrium interpretations, Burns and Kedia (2006) examine the relation between "abnormal" option sensitivity and restatements.

The rest of the paper is organized as follows. Section 2 discusses the conceptual framework of the paper and its relation to the prior literature. Section 3 discusses the out-of- equilibrium incentives and presents the evidence on the nature of the dynamic adjustment process toward the optimal. Section 4 examines the relation between incentive deviation from optimal and financial misreporting. Section 5 concludes.

2. Conceptual Framework, Related Literature and Predictions

Agency theory posits that separation of management from ownership creates agency conflicts where managers exploit private information to extract personal benefits at the expense of financiers (e.g., Jensen and Meckling, 1976). Although equity holdings may mitigate certain agency problems, powerful equity incentives (e.g., delta) might also motivate executives to manipulate accounting information in an effort to increase stock price.[10] If misreporting increases stock price, higher levels of CEO portfolio delta may encourage misreporting as delta measures how responsive the value of an equity portfolio is to an increase in stock price. This claim implicitly assumes that gains to risk-averse executives from misreporting are not dominated by costs associated with amplification of equity risk driven by higher likelihood of extreme negative returns or higher investor uncertainty about the firm's shares (e.g., Armstrong et al., 2013).

Theory papers examining relations between incentives and earnings management show that optimal second best contracts allow for costly earnings management in equilibrium (e.g., Dye, 1988; Evans and Sridhar, 1996; Liang, 2004; Goldman and Slezak, 2006; Sun, 2014). That is, optimal contract design encompasses the simultaneous determination of both incentive intensity

[10] It is common in the literature to conceptualize equity incentives as pay performance sensitivity measured as the sensitivity of a manager's wealth to a percentage change in stock price (portfolio delta).

and misreporting (as well as productive effort) as a function of exogenous parameters characterizing the firm, manager and economic setting. It follows that if observed incentives continuously reflect endogenous, equilibrium choices, there should be no systematic relation between observed CEO incentives and earnings management, conditional on controlling for exogenous determinants of incentives (e.g., Demsetz, 1983; Himmelberg et al., 1999; Demsetz and Villalonga, 2001).[11] However, as recognized by Hermalin and Weisbach (2003) among others, it is hard to distinguish this in-equilibrium interpretation from an alternative out-of-equilibrium interpretation in which non-optimal incentives lead to non-optimal managerial behavior.

We build on Core et al. (2003) and Core and Larcker (2002) who suggest that the distinction between equilibrium and out-of-equilibrium interpretations hinges on assumptions about the extent of adjustment costs necessary to correct suboptimal incentives. When CEO incentives drift out of optimal alignment and firms are constrained in their ability to immediately re-establish optimality, observed CEO incentives can deviate from optimal levels for some period. In this paper we empirically examine the hypothesis that incentive design is a dynamic process where value maximizing firms seek to eliminate any deviations from optimality and restore optimal CEO incentive levels, but are constrained by adjustment cost frictions.

Our empirical approach for isolating deviations from optimal incentives follows Core and Guay (1999) and Li (2002) who investigate whether firms' grants of equity incentives are consistent with the economic theory of optimal contracting. These papers model CEOs' optimal equity incentives and use residuals from the model to capture deviations from optimal levels.

[11] The relation between management ownership and firm value as measured by Tobin's Q has similarly been plagued by this endogeneity issue which leads to a long history of literature on it. They are Demsetz, (1983); Morck, Shleifer and Vishny (1988); Himmelberg, Hubbard, and Palia (1999); Demsetz and Villalonga (2001); Villalonga and Amit (2006); Fahlenbrach and Stulz (2009).

Consistent with these residuals reflecting deviation from optimal and firms seeking to optimally realign incentives, Core and Guay (1999) document that grants of new incentives from options and restricted stock are negatively related to these residuals. Li (2002) extends this result by recognizing that firms and CEOs jointly correct deviations from these optimal levels through equity grants and CEO portfolio rebalancing, and provides evidence consistent with firms and CEOs coordinating their equity-granting and portfolio-rebalancing decisions to manage optimal CEO incentive levels consistent with economic theory.

We estimate a model of optimal incentives and, following Core and Guay (1999), posit that residuals from this model represent deviations from optimal CEO incentives. We then perform a series of analyses to provide evidence that these residuals plausibly reflect deviations from optimal incentive levels. First, if optimal incentives are designed to maximize firm value then deviation from optimality should degrade firm performance. To examine this proposition, we estimate the association between future Tobin's Q and the both positive and negative residuals from our estimation of target incentives.

Second, if these residuals represent deviations from optimal, we expect firms to actively pursue restoration of optimality (e.g., Core and Guay, 1999; Li, 2002). To examine this, we first replicate Core and Guay (1999) utilizing an augmented model of optimal incentives and a significantly longer sample period. However, while this analysis provides evidence consistent with incentive misalignment and firms behaving consistent with the theory of optimal contracting, it does not allows us to directly examine whether adjustment frictions result in persistent deviations from optimal. While Core and Guay (1999) and our extension show that firms actively adjust incentives back towards optimal, it provides no information on whether these adjustments fully restore optimality (i.e., zero adjustment costs) or reflect only partial adjustment (i.e., non-trivial adjustment costs).

If CEO incentives become misaligned and firms' best efforts to restore optimality are hampered by adjustment costs, we would expect to observe only partial adjustment back towards optimal levels. To explore this, we measure the speed of partial adjustment by estimating the proportion of the current gap between target and actual CEO incentives that is closed by actual changes in incentives over the subsequent year. The technique of partial speed of adjustment has been widely used to examine firms' capital structure adjustments (e.g., Lemmon *et al.* 2008; Flannery and Rangan 2006), while a few papers have employed it in an executive compensation context (Cheung and Wei, 2006; Tong 2008; Bushman et al., 2016a). Our speed of adjustment specification regresses actual changes in CEO incentives from year t-1 to year t on the estimated gap between target and actual incentives at year t-1. That is,

$$(Delta_t - Delta_{t-1}) = \lambda * (Target\ Delta_{t-1} - Delta_{t-1}),$$

where the left hand side represents the actual change in incentives and the difference on the right represents the incentive gap to be closed. λ is the estimated speed of adjustment and $Target\ Delta_{t-1}$ is the target level of optimal CEO incentives estimated using available information at time t-1. A coefficient of $\lambda = 1$ implies that 100% of the incentive gap at t-1 is closed by the choice of actual CEO incentives at t. Consistent with frictions impeding full adjustment, $\lambda < 1$ implies that only a fraction λ of the incentive gap is closed. We also disaggregate the incentive gap and explore whether speed of adjustment is symmetrical for positive and negative gaps.

To gain further insight into the dynamic incentive adjustment process, we explore cross-sectional differences in the speed of adjustment across firms. This analysis is based on the premise that speed of adjustment results from a tradeoff between benefits of realigning incentives and adjustment costs, where the nature of this trade-off may differ across firms.

First, we conjecture that speed of adjustment will increase in outside monitoring intensity. The idea is that greater disciplinary pressure imposed on firms shifts the cost-benefit trade-off in favor of faster convergence back to optimal incentives levels. Building on existing literature, we proxy for outside monitoring intensity using three variables: institutional ownership, equity analyst following and board independence. With respect to institutional investors, Barber (2007) documents cumulative announcement period gains of over $3 billion associated with targeting of firms by CalPERS, a large activist institutional investor. Chen et al. (2007) show that in the context of mergers, withdrawal of bad bids is more likely in firms with independent long-term institutional investors. Bushee (1998) shows that institutional investors serve a monitoring role in preventing a firm's reduction of R&D spending for short term benefit, a form of real earnings management.[12] Healy and Palepu (2001) suggest that information intermediaries such as analysts engage in private information production that helps to detect managers' misbehavior. Jensen and Meckling (1976, page 353) argue that "as security analysis activities reduce the agency costs associated with the separation of ownership and control, they are indeed socially productive". Yu (2008) finds that firms followed by more analysts manage their earnings less. While subject to endogeneity concerns and in- versus out-of-equilibrium interpretations, a number of papers provide evidence consistent with independent directors imposing discipline on firm behavior (Hermalin and Weisbach, 2003; Klein, 2002; Dechow, Sloan and Sweeney, 1996). Armstrong et al. (2014) document that following a required increase in the proportion of independent directors, corporate transparency improves.

[12] The monitoring role played by the institutional investors has also been documented in Hartzell and Starks (2003) where they show a positive relation between CEO's pay-performance-sensitivity and institutional ownership.

Second, we conjecture that speed of adjustment will increase in the intensity of product market competition. Economists have long argued that competitive forces act as a disciplining mechanism, exerting pressure on firms to reduce slack and improve efficiency in order to survive (e.g., Scherer 1980, Fama 1980). Giroud and Mueller (2011) and Jagannathan and Srinivasan (1999) provide evidence that competition mitigates managerial slack. Third, we hypothesize that speed of adjustment will be faster for CEOs earlier in their tenure with the firm. Because career concerns can lead CEOs early in their tenure to pursue short-term benefits, such as accounting and real earnings management (e.g., Holmstrom, 1999), boards may seek to adjust misalignments faster to prevent impairment of firm value. Ali and Zhang (2015) document that earnings overstatement is relatively higher for CEOs' in their early tenure with the firm, and this relation is less pronounced for firms with greater external and internal monitoring.

We turn next to explore consequences of deviations from optimal on financial misreporting. A large and growing literature examines relations between executives' portfolio delta and misreporting. Armstrong et al. (2013) summarize eleven prominent papers that empirically model misreporting as a function of equity incentives. With respect to CEOs, seven of these eleven papers document a positive relation between equity incentives and misreporting, and the remaining four find no relation.[13] While reconciling such differences remains an open empirical challenge, this is not the main objective of our paper.[14] Rather, we focus instead on the serious challenge involved in distinguishing in- versus out-of-equilibrium interpretations of empirical associations between

[13] The papers are Cheng and Warfield (2005), Bergstresser and Philippon (2006), Burns and Kedia (2006), Erickson, Hanlon and Maydew (2006) Larcker, Richardson and Tuna (2007), Efendi, Srivastava and Swanson (2007), Cheng and Farber (2008), Cornett, Marcus and Tehranian (2008), Jiang, Petroni and Wang (2010) and Feng, Ge, Luo and Shevlin (2011), and Armstrong, Jagolinzer and Larcker (2010).

[14] For example, see Armstrong et al. (2010) and Armstrong et al. (2013) for recent attempts to resolve this puzzle.

misreporting and CEO incentives. We take an explicit out-of-equilibrium approach and examine relations between financial misreporting and deviations from optimal.

We also exploit the fact that we can distinguish when CEO incentives are too high from when they are too low relative to optimal incentives. Our objective is to investigate whether excessive incentives influence financial misreporting differently than inadequate incentives. As discussed in Armstrong et al. (2010), among others, if misreporting increases stock price, then higher levels of CEO incentives may encourage misreporting. Based on this observation, we conjecture that the sensitivity of misreporting to deviations from optimal will be higher when CEO incentives exceed optimal relative to when incentives are too low.

Similar to our speed of adjustment analysis discussed above, we perform cross-sectional analyses based on differences in monitoring intensity, product market competition and CEO tenure. Based on our earlier arguments, we expect that the sensitivity of misreporting to deviations from optimal will be lower for firms with higher institutional ownership, greater analyst following and more independent boards as greater monitoring discipline associated with these mechanisms will counter-balance effects of incentive misalignment.

With respect to product market competition and early-stage CEO tenure, the predictions are less clear. While discipline from competition may mitigate misreporting incentives, the literature has documented that more intense competitive pressure on profits can create incentives for managers to prop up reported earnings by manipulating accounting numbers (e.g., Markarian and Santalo, 2014; Bushman, et al., 2016). Relatedly for early-term CEOs, while heightened myopic behavior due to career concerns may spur boards to exert more discipline on managers, Ali and Zhang (2015) document that these CEOs are associated with more earnings management. Thus, for competition and early stage CEOs, it is an empirical question as to whether the enhanced discipline associated with these features dominates the enhanced misreporting incentives. Thus, we make no predictions as to how these features will influence the sensitivity of misreporting to deviations from optimal, viewing this as an exploratory analysis to provide insight into the relative strength of these competing forces.

3. Out-of-Equilibrium Incentives and Dynamic Adjustment Back Towards Optimality

A main objective of this paper is to investigate the extent to which CEO stock and option portfolios reflect out-of-equilibrium incentive levels deriving from adjustment cost frictions, and to examine the properties of the dynamic adjustment process reflecting firms' efforts to restore optimality. In section 3.1 we develop our empirical approach for estimating deviations from optimal incentives by using residuals from a model of optimal incentives. In section 3.2 we examine whether these residuals can plausibly be interpreted as deviations from optimal incentives by investigating the relation between the residuals and *Tobin's Q*. Finally, section 3.3 utilizes a speed of adjustment framework to extensively explore characteristics of the dynamic process by which out-of-equilibrium incentive adjust back towards optimal.

3.1 Estimating optimal CEO incentives and deviations from optimal

In this section, we estimate a model of CEO incentives using an extensive set of time varying firm and CEO characteristics to capture changes in target incentives over time, as well as firm fixed effects to capture time invariant aspects of target incentives. Our compensation data is drawn from the Compustat ExecuComp database for the years 1993 to 2015. We supplement this with firm financial information from Compustat and stock return data from CRSP. We measure incentives based on a CEO's entire portfolio holdings of stock and stock options (exercisable and unexercisable) in the firm. The incentive intensity reflected in an executive's equity portfolio is represented by the *delta* of an executive's equity portfolio, defined as the change in value of the portfolio for a 1% change in the price of the underlying stock. Specifically,

$$delta = (\#of\ Shares + \#of\ Options \times Option\,Delta) \times (Price \times .01). \quad (1)$$

Option deltas are estimated using the methodology of Core and Guay (2002) and price refers to the firm's year-end stock price. [15] Since *delta* is positive and right skewed, we follow the literature and use the natural log of *delta* in all of our specifications.

To estimate deviations from optimal incentives, we specify a model of a CEO's optimal incentives that builds on the specifications developed in Core and Guay (1999) and Armstrong and Vashishtha (2012). Specifically,

$$\begin{aligned} \log(delta_t) = {} & \beta_0 + \beta_1 \log(MV_{t\text{-}1}) + \beta_2 \log(idiosyncratic\,risk_{t\text{-}1}) + \beta_3 Book\text{-}to\text{-}Market_{t\text{-}1} \\ & + \beta_4 \log(CEO\,tenure_{t\text{-}1}) + \beta_5 \log(CEO\ Cash\ Compensation_{t-1}) \\ & + \beta_6 Cash\ scaled\ by\ total\ assets + \beta_7 Return_{t\text{-}1} + \beta_8 ROA_{t\text{-}1} + \beta_9 Leverage_{t\text{-}1} \\ & + \beta_{10} Capital_{t\text{-}1} + firm\ fixed\ effect + year\ fixed\ effect + \varepsilon. \end{aligned} \quad (2)$$

Equation (2) incorporates an extensive set of firm and CEO characteristics expected to influence the design of optimal CEO incentives.[16] Firm size, measured as the market value of equity (*MV*), is included based on the premise that larger firms demand more talented CEOs and that CEOs of larger firms tend to be wealthier (Smith and Watts, 1992; Core and Guay, 1999). We expect a positive relationship between firm size and *delta*. Idiosyncratic stock return risk can have conflicting influences on CEO incentive intensity. First, less predictable environments have been posited to have higher monitoring costs that require higher incentives (e.g., Demsetz and Lehn, 1985). In contrast, Jin (2002) documents that idiosyncratic risk is negatively related to pay

[15] Parameters needed to compute option delta are no longer available in ExecuComp for years after 2006. As such, we estimate those parameters first and then compute option delta based on Core and Guay (2002). See Appendix A in Kini and Williams (2012) for detailed explanation.
[16] See the appendix for a detailed description of all variables used in the paper.

performance-sensitivity, but finds little relation between systematic risk and incentive level. We thus have no prediction on the sign of the relationship between idiosyncratic risk and *delta*. Next, it has been argued that it is more difficult to monitor managers of firms with greater investment opportunities, leading firms to shift more intensively towards the use of equity incentives (e.g., Smith and Watts, 1992). We include the *Book-to-Market* ratio to proxy for growth opportunities and expect it to be negatively associated with equity incentives.

We also control for a firm's cash on hand scaled by total assets, as cash-constrained firms may use restricted stock and stock options as substitutes for cash compensation (Core and Guay, 1999). On the other hand, greater cash balances may be associated with greater agency problems (Jensen, 1986; Stulz, 1990). Thus, the sign of the relationship of cash levels with equity incentives is ambiguous. CEO tenure captures both CEO career concerns (Gibbons and Murphy, 1992) and potential horizon problems (Dechow and Sloan, 1991). Consistent with prior literature, we predict a positive relationship between CEO tenure and the level of equity incentives. We include cash compensation to proxy for CEO risk aversion following Guay (1999), who argues that CEOs with higher cash compensation are better able to diversify their portfolio and will therefore be less risk-averse. We thus predict a positive relationship between cash compensation and *delta*. We control for past performance using both lagged stock returns and return on assets as firms may reward managers for their past performance with restricted stock and options (Armstrong and Vashishtha, 2012).

Finally, we control for leverage, as discipline from outside creditors may serve as a substitute or complement for equity incentives, PP&E scaled by total assets to control for the tangibility of the asset base (*Capital*), and firm fixed effects to capture time invariant aspects of target equity incentives. We also include year fixed effects.

In Table 2, Panel A, we estimate equation 1. Summary statistics for all variables used in this analysis are presented in Table 1, Panel A.[17] To explore the relative influence of economy-wide, time invariant and time varying determinants of target *delta*, we run three nested specifications. In column (1) we run an OLS regression that includes only year fixed effects, and document that economy-wide influences explain around 10% of the variation in CEO *delta.* In column (2) we add firm fixed effects, finding that R^2 increases dramatically to 68% from the 10% explained by year fixed effects alone. Finally in column (3), we further include the time varying firm and manager characteristics discussed earlier and see a modest increase in R^2 to 73% from the 68% documented in column (2). The signs of the coefficients on time varying firm and manager characteristics are largely consistent with our expectations and the prior literature. In all analyses to follow we use the residuals from the specification in column (3) of table 2, Panel A to proxy for deviations from optimal CEO incentives (*Residual Delta*).

3.2 Relation between deviations from optimal incentives and Tobin's Q

In this section we explore whether the residuals estimated earlier can plausibly be interpreted as deviations from optimal incentives. The premise of our analysis is that, if optimal incentives are designed to maximize firm value, then deviations from optimality that are sustained through time by adjustment costs should degrade firm value. To examine this, we estimate the association between future *Tobin's Q* and residuals from our estimation of optimal incentives by running the following specification[18]:

[17] In our financial misreporting analysis below, we control for the deviation from optimality of CEOs equity portfolio Vega, which is similarly estimated and reported here in Table 2 panel B .

[18] It is important to note that the residual delta variables used in equation (2) are generated regressors from our first stage regression in Table 2, Panel A (3) (Pagan, 1984). We follow Faulkender et al. (2012) and use Bootstrapped standard errors to account for the generated regressor.

$$Tobin's\,Q_{it} = \alpha + \delta_1 Posiive\,Residual\,Delta_{i,t-1} + \delta_2 Posiive\,Residual\,Delta_{i,t-1} + Tobin's\,Q_{i,t-1} \\ + Other\,Controls + Industry\,\&\,Year\,Fixed\,Effects + \varepsilon_{i,t}. \tag{3}$$

Positive Residual Delta equals the residual from Table 2, Panel A (3) when the residual > 0, and equals zero otherwise. *Negative Residual Delta* equals the residual from Table 2, Panel A (3) when the residual < 0, and equals zero otherwise. To the extent that these residuals reflect deviations from optimal, we expect *Q* to be lower for both positive and negative residuals. Our firm control variables are comparable to those used in Kale et al. (2009) and include industry homogeneity, firm size, return volatility, leverage, R&D and advertising expenditures, and dividend yield. In addition, we further control for past performance by including lagged Tobin's Q, lagged ROA and lagged annual stock returns. Finally, we include industry and year fixed effects. Descriptive statistics for all variables are reported in Table 1, Panel B.

Results from running equation (3) are reported in Table 3. We find that positive residuals (i.e., incentives too high) are negatively and significantly associated with future *Q*, while negative residuals (i.e., incentives too low) are positively and significantly associated with future *Q*. Together, these results suggest an inverted U-shaped relationship between residual incentives and future firm value, providing evidence consistent with deviations from optimal incentives degrading firm value, whether these incentives are either too high or too low. We note however, that the coefficient on *Positive Residual Delta* is substantially greater in absolute magnitude (-.145) than the coefficient on *Negative Residual Delta* (.022), suggesting that excessive incentives have a larger negative impact on firm value than under incentives.

We next empirically investigate the nature of the process by which firms dynamically adjust CEO incentives back towards optimality.

3.3 Dynamic adjustment process of out-of-equilibrium incentives towards optimality

The results in Table 3 just discussed provide evidence consistent with adjustment costs preventing firms from fully restoring optimal incentives, where the resultant out-of-equilibrium incentives negatively impact firm value. If adjustment costs are indeed the cause of deviations from optimal, we would expect value maximizing firms' to dynamically manage incentives towards optimal target incentives. In this section we use two approaches to explore this hypothesis. First, we follow Core and Guay (1999) and examine the extent to which firms use future equity grants to move currently out-of-equilibrium incentives towards optimal levels. Second, the presence of non-trivial adjustment costs hinder the efforts of value maximizing firms to immediately restore misaligned incentives, which would result in only partial adjustment of incentives towards optimal. We examine this possibility in a speed of partial adjustment framework.

Out-of-equilibrium incentives and future equity grants

If a CEO's incentives drift away from optimal alignment, a natural step firms would take to actively pursue restoration of optimality is to adjust CEO's incentives through its annual grant. To examine this, we begin by replicating Core and Guay (1999) using an extended model of optimal CEO incentives and a substantially longer sample period that extends from 1993-2015. A main innovation in our model of CEO incentives is to include firm fixed effects along with several additional time varying firm and manager characteristics. As reported in table 2, Panel A, our model of CEO incentives explains 73% of the variation in CEO delta, where the model in Core and Guay (1999, Table 2) explains about 48% of the variation. This suggests a substantial amount of unobserved firm-level heterogeneity underpinning the incentive choices of firms. We run the following specification:

$$Log(1+NewGrant_{it}) = \alpha + \gamma_1 Residual\ Delta_{i,t-1} + Controls_{i,t-1} + Industry\&Year\ Fixed\ Effects + \varepsilon_{it}, \quad (4)$$

where *New Grant* is computed as the portfolio delta of the subsequent year's grant of stock and options to the CEO, and *Residual Delta* is defined as previously. We predict that γ_1 will be negative as firms use equity grants to counteract deviations from optimal incentives. Our control variables mirror those in Core and Guay (1999), where all of these variables are described in the Appendix and descriptive statistics are reported in Table 1, Panel C.

The results from estimating equation (4) are reported in Table 4, Panel A. As in Core and Guay (1999), we document that the coefficient on *Residual Delta* is negative and significant using both an OLS and Tobit specification. However, while these results are consistent with the notion that firms actively adjust incentives back towards optimal, it provides no information on whether these adjustments fully restore optimality (i.e., zero adjustment costs) or reflect only partial adjustment (i.e., non-trivial adjustment costs). In the next section we examine this issue more carefully using a partial speed of adjustment framework.

Estimating Partial Speed of Adjustment of Towards Optimality

If shocks push CEO incentives out of alignment, and firms' efforts to counteract these shocks and restore optimality are subject to adjustment costs, we would expect these shocks to only partially dissipate as boards manage incentives towards optimality. To explore this, we estimate how much of incentive gap between target PPS dispersion and actual dispersion is closed over the subsequent year. Specifically, we use the following specification:

$$CEO\ Delta_t - CEO\ Delta_{t-1} = \alpha + \lambda^*(Target\ Delta_{t-1} - CEO\ Delta_{t-1}) + \varepsilon_t \text{, or} \quad (4a)$$

$$CEO\ Delta_t = \alpha + (1-\lambda)^*\ CEO\ Delta_{t-1} + \lambda^* Target\ Delta_{t-1} + \varepsilon_t , \quad (4b)$$

where $Target\ Delta_{t-1}$ is the estimated target value of *CEO Delta* using data available at time *t*-1 (e.g., equation (2) above). To understand the intuition of this analysis, note that equation (4a) regresses the actual change in *CEO Delta* from *t-1* to *t* on the incentive gap between $Target\ Delta_{t-}$

$_1$ and actual *CEO Delta* at *t-1*. The coefficient λ in (4a) is referred to as the speed of adjustment (SOA), and can be interpreted as the proportion of the gap between target and actual CEO incentives at time *t-1* that is closed by the actual change in CEO incentives from year *t-1* to *t* (e.g., Lemmon, Roberts, and Zender 2008). Equation (4b) simply rearranges the terms in (4a).

We first adopt the technique developed in Flannery and Rangan (2006) and Lemmon *et al.* (2008) to estimate equation (4b) and examine how much of the incentive gap in year t-1 is closed by the change of incentives from year t-1 to year t. In Panel B of Table 4, we present the results with both OLS regression and system general method of moments (Blundell and Bond, 1998). GMM is used due to potential bias associated with OLS with panel data (Hsiao, 2003). We find that the estimates of SOA using OLS or GMM are close to each other, where SOA is 0.43 (=1-0.57) from OLS and 0.38 (=1-0.62) from GMM. These results provide evidence consistent with the existence of adjustment costs where boards' actively, but only partially, adjust executives' incentives towards the optimal level.

To facilitate parsimonious presentation of our interaction analyses to follow, we adopt the approach in Faulkender et al. (2012) and use a two-step procedure for estimating speed of adjustment. Specifically, we estimate the specification in equation (4a) using the predicted value of *Delta* from our estimation of optimal CEO incentives in Table 2, Panel A, column (3) to proxy for *Target Delta* at t-1. We again report bootstrapped standard errors to deal with the generated regressor issue. As shown in column (1) of Table 4. Panel C, we find that the estimate for SOA (0.43) is similar to the SOA estimates in table 4, Panel B (OLS). We next use this two-step specification to explore the properties of the dynamic incentive adjustment process in more depth.

First, we disaggregate the incentive gap and explore whether the speed of adjustment is symmetric for positive and negative gaps. When incentive gap = ($Target\ Delta_{t-1} - CEO\ Delta_{t-1}$)

> 0, incentives are too low and must be increased to meet target and vice versa for negative gaps. The results reported in column (2) of Table 4, Panel C provide evidence that SOA is characterized by asymmetric responses to positive and negative incentives gaps. Specifically, SOA is 0.50 when the gap is positive and 0.37 when the gap is negative, where the difference between these two SOA estimates is statistically significant with p-value of 0.0001 as shown at the bottom of panel C. This suggests that the adjustment is easier when the CEO is under incentivized than when the CEO is over incentivized.

Finally, we perform cross-sectional analyses to explore whether the partial speed of adjustment is influenced by differences across firms in monitoring intensity, product market competition and CEO tenure. Based on our earlier arguments, we expect SOA to be faster for (1) firms with higher institutional ownership, greater analyst following and more independent boards due to greater monitoring discipline associated with these mechanisms; (2) firms facing more intense product market competition due to the discipline of competitive pressure; and (3) firms with CEOs earlier in their tenure as boards seek to adjust misalignments faster to prevent impairment of firm value due to CEO career concerns.

Analyst following is from IBES; institutional ownership is from Reuters 13f; and board information is from the ISS Directors database, which only covers the period 1999 to 2013. We proxy for product market competition using the total similarity measure from Hoberg and Phillips (2016), which is based on text-based analysis of firms'10-K product descriptions. Total similarity is the sum of the pairwise cosine similarities between a given firm's product description and those of all other firms in a given year, where higher values indicate more intense product market competition.[19] CEO tenure is extracted from ExecuComp. Descriptive statistics for these variables are found in Table 1, Panel D.

In Panel D of Table 4 we run the following specification:

$$\begin{aligned} Delta_{it} - Delta_{i,t-1} &= \alpha + \lambda * (Target\,Delta_{i,t-1} - Delta_{i,t-1}) \\ &+ \lambda_1 (Target\,Delta_{i,t-1} - Delta_{i,t-1}) * CV + \lambda_2 CV + \varepsilon_{it}\,, \end{aligned} \tag{5}$$

where *CV* is one of the cross-sectional variables described just above. In table 4, Panel D we find that coefficient λ_1 is positive and statistically significant for all of our cross-sectional variables. Specifically, we find that SOA is faster when there is higher analyst following, the institutional investor percentage is higher or when the board is more independent. We also find that SOA is faster when product market is more competitive and when the CEO is in her early tenure with the firm.

In this section, we have provided evidence consistent with the incentive residuals reflecting deviations from optimal incentives. Specifically, we document that *Tobin's Q* is decreasing in both positive and negative residuals; incentives embedded in subsequent equity grants to CEOs are negatively related to residuals; and firms only partially close the gap between target and actual CEO incentives over the subsequent year. Further, we document cross-sectional differences in speed of adjustment towards optimality linked to differences in monitoring intensity, product market competition and CEO tenure.

4. Relations between deviations from optimal incentives and financial misreporting

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[19] The total similarity data used in our paper was retrieved in July 2017 from the Hoberg-Phillips Data Library at http://hobergphillips.usc.edu/industryconcen.htm .

Building on our previous analyses, in this section we adopt an explicit out-of-equilibrium perspective on CEO incentives and investigate the extent to which deviations from optimality are associated with financial misreporting. We proxy for misreporting using both performance matched discretionary accruals and AAERs (SEC Accounting and Auditing Enforcement Releases), and again use residuals from our estimation of target incentives to capture deviations from optimal.

4.1 Measuring financial reporting with performance matched discretionary accruals

To estimate performance-matched discretionary accruals, we first use a cross-sectional model of accruals proposed by McNichols (2002) to estimate discretionary accruals, in which she combines the Jones (1991) and Dechow and Dichev (2002) models.[20] Specifically, we use the following model to estimate discretionary accruals (DA).

$$ACC_{it}/A_{it-1} = \beta_0 + \beta_1 * CFO_{it-1}/A_{it-2} + \beta_2 * CFO_{it}/A_{it-1} + \beta_3 * CFO_{it+1}/A_{it} + \beta_4 * \Delta REV_{it}/A_{it-1} + \beta_5 * PPE_{it}/A_{it-1} + \varepsilon_{it}\,. \quad (6)$$

ACC_{it} is the accruals of firm *i* in year *t*, defined as earnings before extraordinary items minus cash flow from operations. A_{it-1} is total assets of firm *i* at the beginning of year *t*. CFO_{it} (CFO_{it-1}, CFO_{it+1}) is cash flow from operations for firm *i* in year *t* (*t-1*, *t+1*). ΔREV_{it} is the change in revenue for firm *i* in year *t*. PPE_{it} is gross property, plant, and equipment for firm *i* in year *t*. We use all the available observations in Compustat to run this model by year and by industry (two-digit SIC code) that have at least 6 observations. We obtain residuals, ε_{it}, from these regressions for initial discretionary accruals.[21] We then follow the procedure in Kothari, Leone, and Wasley (2005) to

[20] Our results are robust if we use performance matching based on Jones (1991) model or Dechow and Dichev (2002) model.

[21] Some prior studies use absolute value of residuals to measure earnings management (for example, Bergstresser and Philippon 2006). However, we use signed residuals for the following reasons. First, there is no reason to believe the existing equity incentives would lead to income-decreasing, not income-increasing accruals; second, Hribar and

calculate the performance-adjusted discretionary accruals using year, industry and *ROA*. Appendix provides definition and measurement for all variables used in this paper. Descriptive statistics for our estimation of DA are included in Table 1, panel D. Our estimates of DA are in line with those found in the previous literature. We next run a series of analyses where we regress DA on *Residual Delta* (as defined earlier) and various controls.

We begin our exploration in Table 5, Panel A where for descriptive purposes we first present partial correlations of DA with both the predicted value of delta and the residual delta estimated from Table 2, Panel A, column (3). It shows that when both components (predicted incentives and residual incentives) are included in the model, only the residual incentives, not the predicted incentives, load positively and significantly, where the larger the residual incentives, the larger the earnings management.

In our next specification, we drop the predicted value of delta and, based on the results in Armstrong et al. (2013), we add a control for residual vega (the residual from the estimation in Table 2, Panel B).[22] As reported in Table 5, Panel B the coefficient on *Residual Delta* is positive and significant, consistent with deviations from optimal incentives exacerbating out-of-equilibrium earnings management behavior. In contrast, the coefficient on *Residual Vega* is not statistically different from zero.

We next exploit the fact that we can distinguish when CEO incentives are too high from when they are too low relative to optimal incentives and investigate whether excessive incentives influence financial misreporting differently than inadequate incentives. As discussed earlier, we conjecture that the sensitivity of misreporting to deviations from optimal will be higher when CEO

Nichols (2007) specifically examine the problem associated with unsigned discretionary accrual measure used to capture earnings management.

[22] Note that by construction the predicted value and the residuals are orthogonal, so dropping the predicted value does not induce a correlated omitted variable issue.

incentives exceed optimal relative to when incentives are too low. Table 5, Panel C shows that positive residuals exert a larger positive effect on earnings management (coefficient of 0.006; t-value of 2.92) than do negative residuals (coefficient of 0.001; t-value of 0.57). The difference between the two coefficients are statistically significant (p-value = 0.04), suggesting that only when the incentives are excessive do they lead to the earnings management.

Similar to our speed of adjustment analysis discussed above, we perform cross-sectional analyses based on differences in monitoring intensity, product market competition and CEO tenure. Based on our earlier arguments, we expect that the sensitivity of misreporting to deviations from optimal will be lower for firms with higher institutional ownership, greater analyst following and more independent boards as greater monitoring discipline will counteract the influence of incentive misalignment on financial misreporting. With respect to product market competition or CEO tenure, we make no predictions as to how these features will influence the sensitivity of misreporting to deviations from optimal, viewing this as an exploratory analysis.

Table 6 provides the results of this interaction analysis exercise. For the monitoring intensity variables, we find that all three variables significantly weaken the relation between *Positive Residual Delta* and DA. For example, the coefficient drops from 0.017 to 0.006 when the number of analyst following the firm rises from low to high. Similar results hold for institutional ownerships and board independence. In contrast, these monitoring intensity variables have no significant effect on the sensitivity of misreporting to *Negative Residual Delta.* Interestingly, we find that for product market competition, fiercer competition actually strengthens the relation between *Positive Residual Delta* and earnings management (from 0.008 to 0.020). Similarly, for early tenured CEOs, the positive relation between DA and *Positive Residual Delta* is similarly strengthened with the coefficient rising from 0.007 to 0.020. This suggests that the influence of out-of-equilibrium incentives on earnings management is exacerbated when competition increases or CEOs are early in there tenure.

4.2 Measuring financial reporting with AAER events

Given the well-known issues associated with discretionary accrual models, an alternative way to pin down managers' financial misreporting is to consider events in which firms are caught misreporting. One particular type of events is based on SEC enforcement actions against a company, an auditor or an officer for alleged accounting and/or auditing misconduct. The advantage of using this data instead of discretionary accruals is that SEC has strong evidence that these event firms have manipulated their financial statements so that we have confidence that they are the guilty ones. However, the downside associated with this data set is the possibility that we may classify some guilty ones as innocent when the SEC has failed to catch them.

Also, compared to other event samples such as restatement or litigation, using AAERs has the following advantages as discussed in Dechow et al. (2011): The GAO restatement sample includes all restatements relating to accounting irregularities regardless of managerial intent, materiality and economic significance and it also does not specify the year the misreporting has occurred but when it is identifies; class action lawsuit sample such as Stanford Law Database includes many cases that are not related to financial misstatement. In contrast, AAERs are those which are issued by the SEC only after it has established intent or gross negligence on the part of management in making the misstatement. As such, we choose to use AAERs for this section analyses.

Our AAER event data is from CFRM. Following Dechow, Ge, Larson and Sloan (2011), we consider AAER events for both quarterly ones and annual ones.[23] We end up with 341 AAER events used in our sample. Using AAER sample, we redo the same analyses as those in Table 5 and Table 6 and report the results in Table 7 and Table 8. In panel A of Table 7, we similarly show that only the residual incentives, not the predicted incentives, have positive impact on the probability of being enforced by the SEC and this relation holds after we control for residual vega (panel B of Table 7). Further, panel C of Table 7 shows that *Positive Residual Delta* has a much larger impact on the probability of an AAER than does *Negative Residual Delta* (0.874 with z-value of 3.20 vs. 0.032 with z-value of 0.19). The difference between these two coefficients is statistically significant with a p-value of 0.02.

Regarding the cross sectional variations in monitoring, CEO tenure or competition, Table 8 shows that the monitoring by the analysts, institutional investors or independent boards acts as counterforce to mitigate the relation between *Positive Residual Delta* and the probability of enforcement by the SEC. And the p-values for the sum of the two coefficients (main effect from the positive residuals and the interaction between positive residuals and monitoring variable) across all three monitoring variables suggest that better monitoring completely neutralizes the positive relation between positive residual incentives and the enforcement probability by the SEC. On the other hand, for the early tenured CEOs or firms facing more fierce competition, the relation between positive residuals and the enforcement probability becomes stronger. All these results from both table 7 and table 8 are consistent with those from table 5 and table 6 when discretionary accruals are used as the measure for earnings management.

4.3 Sensitivity tests

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[23] Readers can find more details in Dechow et al. (2011) regarding their data collection process and variable definitions, etc.

In this subsection, we conduct two sensitivity tests. In the first, we utilize a change model specification as suggested by Fahlenbrach and Stulz (2009). In the second, we address the potential bias problem associated with discretionary accrual variable when it is used as a second stage dependent variable. Here we use a one-stage analysis (Chen, Hribar and Melessa, 2017). For brevity, we focus only on the relation between residual incentives and earnings management (discretionary accruals/accruals).

Table 9 presents the results from the change model and we find that when the *Residual Delta* gets bigger, the discretionary accruals also get larger, providing consistent result about how deviation incentives from the optimal affects earnings management. Table 10 offers the results on the impact on accruals separately from predicted incentives and residual incentives and again, we find that it is the residual incentives, not predicted incentives, which impact the accruals. Together, both sensitivity tests provide robust results on the relation between deviations from the optimal incentives and earnings management.

5. Summary

A common view in the academic literature is that incentive contracts are always at optimal equilibrium levels because firms can continuously and completely counteract shocks that cause deviations from optimal e.g., (Demsetz and Lehn, 1985). In contrast, this paper takes the perspective that incentive contracting involves a process in which incentives are dynamically adjusted towards optimality, but are constrained from doing so by adjustment cost frictions. We provide evidence consistent with such adjustment costs sustaining out-of-equilibrium incentives that can negatively impact firm value. Our dynamic perspective allows us to provide new insight into the trajectory of the incentive contracting process. We provide evidence of asymmetry in the adjustment trajectory, where incentives converge towards optimal more quickly when target incentives exceed actual, consistent with it being easier to remedy incentives that are too low than to decrease excessive incentives. We also provide cross-sectional analyses showing that the speed with which incentives adjust towards optimal is increased by disciplinary forces exerted by outside monitoring intensity and competitive pressures in the product market, and by CEO career concerns which increase the negative consequences associated with out-of-equilibrium incentives.

Our adjustment cost focus also provides a fresh take on the relation between CEO incentives and financial misreporting. The previous literature finds mixed results where some papers find a positive relation, while others find no relation (e.g., Armstrong et al., 2013). Further, these papers face significant challenges in distinguishing between an in- versus out-of-equilibrium interpretation of documented empirical associations. We document evidence consistent with there being an out-of-equilibrium component of misreporting associated with deviations from optimal incentives. Our approach also sheds new light on the nature of financial misreporting by revealing an asymmetry in which the sensitivity of misreporting to deviations from optimality is significantly stronger for excessive relative to inadequate incentive levels. Finally, we provide new evidence on cross-sectional differences in the sensitivity of misreporting to deviations from optimal related to monitoring intensity, product market competition and CEO tenure.

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Appendix: Variable Definition and Measurement

Dependent Variables:	
AAER	Indicator variable that equals one if the firm has AAER in the year, and zero otherwise within the ExecuComp sample.
DA	Performance matched discretionary accruals with McNichole (2002) model while matching is based on year, industry and ROA (Kothari et al, 2005).
Delta	Natural logarithm of (PPS+1) while PPS is estimated with Core and Guay (1999) model.
New Grants	PPS of annual grant of stock and options to CEO.
ROA	Return on asset, income before extraordinary items scaled by lagged total asset.
Tobin's Q	Measured as ((Total asset – Book value of equity + Market value of equity)/ Total asset)
Vega	Natural logarithm of (sensitivity of CEO options holdings to stock price volatility +1) while the sensitivity is estimated with Core and Guay (2002) model.
Independent Variables:	
Analyst Following	Number of analysts who follow a firm.
BM	Book-to-market ratio of equity.
Board Independence	Dummy variable which equals one if more than 51% of board directors are from outside at the beginning of the year, and zero otherwise.
Capital	Net of PP&E scaled by total asset.
Cash	Cash holding scaled by total asset.
Cash Flow Shortfall	Three-year average of [(common and preferred dividends + cash flow from investing - cash flow from operations) / total assets].
CEO Tenure	CEO's tenure in a firm.
Dividend Constraint	Dummy variable which equals one if the firm is dividend constrained in any of the three years prior to the year the new equity grant is awarded.
Early CEO Tenure	Dummy variable which equals one if it is the first 3 years of CEO tenure with the firm, and zero otherwise.
Firm Age	Firm age, measured as number of years for a firm to appear in CRSP database.
High Analyst Following	Dummy variable which equals one if Analyst Following is above median of the sample, and zero otherwise.
High Institution Ownership	Dummy variable which equals one if Institutional Ownership is above median of the sample, and zero otherwise.
Idiosyncratic Risk	Standard deviation of the residual from a market model regression estimated over the fiscal year with daily returns.

Industry log (1+ Cash Compensation)	Industry mean of natural logarithm of (1 + cash compensation of CEO)
Industry log (1+ Delta)	Industry mean of natural logarithm of (1 + Delta of CEO)
Institution Ownership	Percentage of outstanding shares held by the institutional investors.
Intangible	Sum of advertising expenses and R&D expenses, scaled by sales.
Leverage	Financial leverage, measured as total liability divided by total asset.
Log (Sales)	Natural logarithm of sales
NOA	Net operating asset, calculated as shareholders' equity minus cash and marketable securities, plus total debt, divided by sales.
NOL	net operating loss, a dummy variable which equals one if operating income after depreciation is negative for any of the previous three years, and zero otherwise.
Product Market Competition	Total similarity measure from Hoberg and Phillips (2016) based on text-based analysis of firms'10-K product descriptions. Computed as the sum of the pairwise cosine similarities between the given firm's product description and those of all other firms in the given year. Higher values of total similarity indicate that a firm faces more intense product market competition in a given year.
Residual Delta	Actual delta minus predicted delta based on column (2) of panel A of Table 2.
Residual Vega	Actual vega minus predicted vega based on column (2) of panel B of Table 2.
Return	Annual buy-and-hold return.
Size	Natural logarithm of market capitalization.
STD_CF	Standard deviation of annual cash flow from operation scaled by total asset over the last 10 years.
STD_Sale	Standard deviation of annual sales scaled by total asset over the last 10 years.

Table 1 Summary Statistics

This table reports the summary statistics for all variables used in this study. Depending on the analyses, we have four different samples: panel A is based on the sample used in estimating target levels of CEO delta and vega (Table 2); panel B is based on the sample used in for the analysis of deviations from optimal CEO delta and Tobin's Q (Table 3); panel C is based on the sample used in the dynamic adjustment of CEO incentives adjustment analyses (Tables 4) and panel D is based on the sample used in earnings management analyses (the rest of the tables). The sample period covers 1992 to 2015 for most of the variables except AAER (1993-2015) and board independence (1999-2013). All continuous variables are winsorized at 1% and 99%. See Appendix for variable definition and measurement.

Panel A: Estimating target levels of CEO delta and vega Sample (Table 2)

	Mean	Std. Dev.	Median	Q1	Q3
CEO PPS (Raw)	1144.2	10872.5	66.5	180.7	514.9
CEO Vega (Raw)	20.0	104.1	0.0	0.0	12.2
CEO Delta (after Log)	5.189	1.718	4.211	5.202	6.246
CEO Vega (after Log)	1.271	1.662	0.000	0.000	2.578
$Size_{t-1}$	7.527	1.600	6.408	7.410	8.527
BM_{t-1}	0.542	0.439	0.284	0.458	0.684
Log(idiosyncratic risk)$_{t-1}$	-3.954	0.496	-4.318	-3.973	-3.614
Log (CEO Tenure)$_{t-1}$	2.099	0.587	1.609	2.079	2.485
Log (CEO Cash Compensation +1)$_{t-1}$	6.785	0.841	6.386	6.779	7.169
Cash scaled by total asset$_{t-1}$	0.136	0.162	0.022	0.071	0.194
$Return_{t-1}$	0.193	0.643	-0.097	0.121	0.356
ROA_{t-1}	0.045	0.107	0.017	0.047	0.085
$Leverage_{t-1}$	0.534	0.211	0.385	0.547	0.684
$Capital_{t-1}$	0.269	0.239	0.076	0.197	0.409

Panel B: Analysis of deviations from optimal CEO delta and Tobin's Q (Table 3) Sample

	Mean	Std. Dev.	Median	Q1	Q3
Tobin's Q	1.822	1.084	1.151	1.483	2.102
Positive Residual Delta$_{t-1}$	0.249	0.414	0.000	0.036	0.369
Negative Residual Delta$_{t-1}$	-0.252	0.545	-0.301	0.000	0.000
R&D to Capital$_{t-1}$	0.366	2.202	0.000	0.000	0.173
Industry Homogeneity$_{t-1}$	0.215	0.112	0.127	0.184	0.297
Firm Size$_{t-1}$	7.398	1.587	6.301	7.303	8.437
Firm Size$^2_{t-1}$	57.249	24.157	39.697	53.337	71.187
Return Volatility$_{t-1}$	0.017	0.031	0.006	0.011	0.020
Capital to Sales$_{t-1}$	0.455	0.819	0.108	0.202	0.429
Leverage$_{t-1}$	0.214	0.165	0.066	0.204	0.328
Advertising to Capital$_{t-1}$	0.100	0.604	0.000	0.000	0.042
Dividend Yield$_{t-1}$	0.015	0.030	0.000	0.008	0.023
Tobin's Q$_{t-1}$	1.869	1.266	1.154	1.491	2.127
ROA$_{t-1}$	0.043	0.104	0.018	0.047	0.084

Panel C: For the Tables on Dynamic Adjustment of CEO Incentives Adjustment (Table 4)

	Mean	Std. Dev.	Median	Q1	Q3
Log (New Grant + 1)	2.739	1.591	1.744	2.979	3.922
Incentive residual$_{t-1}$	-0.008	0.769	-0.308	0.029	0.361
Log (Sales)$_{t-1}$	7.342	1.544	6.258	7.248	8.372
BM$_{t-1}$	0.672	0.262	0.474	0.679	0.875
NOA$_{t-1}$	0.134	0.340	0.000	0.000	0.000
Cash flow shortfall$_{t-1}$	-0.161	0.115	-0.226	-0.152	-0.090
Dividend constraint$_{t-1}$	0.432	0.495	0.000	0.000	1.000
Return$_{t-1}$	0.147	0.442	-0.114	0.104	0.337

Panel D: For the Rest of Tables

	Mean	Std. Dev.	Median	Q1	Q3
DA	-0.021	0.106	-0.070	-0.010	0.039
AAER	0.019	0.138	0.000	0.000	0.000
Residual Delta	0.020	0.687	-0.298	0.043	0.382
ROA_{t-1}	0.049	0.086	0.023	0.053	0.090
Size	7.455	1.584	6.334	7.334	8.473
BM	0.508	0.340	0.274	0.437	0.647
Leverage	0.503	0.196	0.363	0.522	0.650
NOA	1.137	0.848	0.600	0.871	1.323
Firm Age	26.13	19.53	11.00	21.00	36.00
Return	0.156	0.477	-0.118	0.105	0.343
Capital	0.310	0.233	0.122	0.243	0.461
Intangible	0.054	0.095	0.000	0.015	0.064
STD_CF	0.053	0.039	0.027	0.043	0.065
STD_Sale	0.177	0.137	0.085	0.140	0.226
Analyst Following	9.401	7.696	7.545	3.545	13.818
Institution Ownership	0.672	0.273	0.727	0.542	0.861
Board Independence	0.874	0.332	1.000	1.000	1.000
CEO Tenure	8.874	6.592	4.000	7.000	11.000
Product Market Competition	4.490	7.320	1.339	2.147	4.282

Table 2 Estimating Target Levels of CEO Delta and Vega

In this table we estimate CEOs' optimal Delta by regressing CEO Delta on lagged determinants of CEO equity incentives. In later analyses we use the residual from this model, denoted Residual Delta, as a proxy for deviations of delta from optimal levels due to costs of adjustment. The sample period covers 1992 to 2015. We similarly estimate CEO vega (panel B). The OLS regressions are estimated clustered by firm. See Appendix for variable definition and measurement.

Panel A: Estimating CEO delta

Dependent Variable =	CEO $Delta_t$					
	(1)		(2)		(3)	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Intercept					0.532	1.58
$Size_{t-1}$					0.427	14.14
BM_{t-1}					-0.092	-2.48
Log(idiosyncratic $risk)_{t-1}$					0.115	2.68
Log (CEO $Tenure)_{t-1}$					0.647	22.51
Log (CEO Cash Compensation $+1)_{t-1}$					0.046	1.35
Cash scaled by total $asset_{t-1}$					0.295	1.92
$Return_{t-1}$					0.083	4.97
ROA_{t-1}					0.381	3.08
$Leverage_{t-1}$					-0.061	-0.46
$Capital_{t-1}$					-0.109	-0.53
Firm fixed effects	No		Yes		Yes	
Year fixed effects	Yes		Yes		Yes	
R^2	0.0990		0.6820		0.7323	
N	22,616		22,616		22,616	

Panel B: Estimating CEO vega

Dependent Variable =	CEO $Vega_t$					
	(1)		(2)		(3)	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Intercept					-0.604	-1.50
$Size_{t-1}$					0.302	8.25
BM_{t-1}					-0.053	-1.50
Log(idiosyncratic $risk)_{t-1}$					0.274	5.15
Log (CEO $Tenure)_{t-1}$					0.019	0.62
Log (CEO Cash Compensation $+1)_{t-1}$					0.118	3.45
Cash scaled by total $asset_{t-1}$					-0.326	-1.85
$Return_{t-1}$					-0.083	-5.37
ROA_{t-1}					-0.028	-0.21
$Leverage_{t-1}$					-0.098	-0.61
$Capital_{t-1}$					-0.058	-0.24
Firm fixed effects	No		Yes		Yes	
Year fixed effects	Yes		Yes		Yes	
R^2	0.2290		0.4893		0.4998	
N	22,616		22,616		22,616	

Table 3 Deviations from Optimal CEO Delta and Tobin's Q

We examine how positive and negative deviations of delta from optimal levels affect Tobin's Q. Deviations of delta from optimal levels are measured using regression residuals from the estimation in Table 2, Panel A. Positive Residual Delta equals the residual from Table 2, Panel A (2) when the residual > 0, and equals zero otherwise. Negative Residual Delta equals the residual from Table 2, Panel A (2) when the residual < 0, and equals zero otherwise. The sample period covers 1992-2015. See the appendix for variable definition and measurement. The OLS regressions are estimated clustered by firm. Standard errors are bootstrapped to account for generated regressors.

Dependent =	Tobin's Q_t	
	Coefficient	t-value
Intercept	0.896	4.05
Positive Residual $Delta_{t-1}$	-0.145	-8.63
Negative Residual $Delta_{t-1}$	0.022	2.23
R&D to $Capital_{t-1}$	0.005	0.78
Industry $Homogeneity_{t-1}$	-0.086	-1.21
Firm $Size_{t-1}$	-0.019	-0.46
Firm $Size^2_{t-1}$	0.002	0.70
Return $Volatility_{t-1}$	-0.391	-1.09
Capital to $Sales_{t-1}$	0.019	1.22
$Leverage_{t-1}$	-0.242	-3.82
Advertising to $Capital_{t-1}$	0.015	0.99
Dividend $Yield_{t-1}$	0.044	0.12
Tobin's Q_{t-1}	0.611	11.70
ROA_{t-1}	0.524	2.06
Industry Fixed Effect	Yes	
Year Fixed Effect	Yes	
R^2	0.6085	
N	19,182	

Table 4 Dynamic Adjustment of CEO Incentives

In Panel A we examine relations between future equity grants to CEOs by boards of directors and deviations of CEO incentives from optimal levels. Residual Delta is the regression residual from the estimation in Table 2, Panel A, column (2). This panel replicates the main results in Core and Guay (1999) over a different time frame using a more extensive model of CEO incentives. The sample period covers 1992-2015. Panel B estimates speed of adjustment for CEO incentives using both an OLS and a System GMM specifications, where estimated SOA is given by one minus the coefficient on CEO $Delta_{t-1}$ (i.e. 1- β_1); in panel C we follow Faulkender et al. (2012) and estimate SOA with OLS by first computing the gap between target and actual Delta at year t-1 (Target-Delta Gap) using the predicted value of Delta from Table 2, Panel A, column (2) to proxy for target Delta at t-1. Estimated SOA is given by the coefficient on Delta Gap. We also split the gap into positive and negative components where Positive Delta Gap = Delta Gap when Delta Gap > 0, and zero otherwise; and Negative Delta Gap = Delta Gap when Delta Gap < 0, and zero otherwise. In panel D we use the Faulkender et al. (2012) OLS specification to consider how SOA varies cross-sectionally with analyst following, institutional ownership, board independence, how early the CEO is in their tenure with the firm and intensity of a firm's product market competition . The sample period covers 1992-2015. See appendix for variable definition and measurement. The OLS regressions are estimated clustered by firm. Standard errors are bootstrapped to account for generated regressors.

Panel A: new grants

Dependent Variable =	Log (New Grant + 1)$_t$			
	OLS		Tobit	
	(1)		(2)	
	Coefficient	t-value	Coefficient	t-value
Intercept	-0.941	-4.35	-1.211	-7.49
Residual $Delta_{t-1}$	-0.045	-2.39	-0.058	-4.04
Log $(Sales)_{t-1}$	0.508	30.76	0.540	64.61
BM_{t-1}	-0.462	-11.30	-0.528	-17.65
NOL_{t-1}	0.128	2.77	0.130	3.44
Cash Flow $shortfall_{t-1}$	-0.358	-2.06	-0.341	-3.01
Dividend $constraint_{t-1}$	0.099	2.74	0.098	3.95
$Return_{t-1}$	0.306	10.66	0.336	11.53
Industry fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
Pseudo R^2 / R^2	0.3050		0.0826	
N	20,126		20,126	

Panel B: Speed of adjustment using OLS and System GMM specifications

$Delta_t = (1-\lambda) * Delta_{t-1} + Controls + \varepsilon_t$, where $\lambda =$ Speed of Adjustment.

Dependent Variable =	CEO $Delta_t$			
	OLS		GMM	
	Coefficient	t-value	Coefficient	t-value
CEO $Delta_{t-1}$	0.566	32.35	0.618	19.78
$Size_{t-1}$	0.015	0.68	-0.625	-15.47
BM_{t-1}	-0.007	-0.25	-0.001	-0.04
Log(idiosyncratic risk)$_{t-1}$	0.073	2.49	0.052	1.22
Log (CEO Tenure)$_{t-1}$	0.181	7.91	0.269	6.10
Log (CEO Cash Compensation +1)$_{t-1}$	0.046	2.23	0.023	1.04
Cash scaled by total asset$_{t-1}$	0.432	4.12	0.699	4.72
$Return_{t-1}$	0.044	3.55	0.035	2.25
ROA_{t-1}	0.137	1.48	-0.115	-0.93
$Leverage_{t-1}$	-0.072	-0.75	-0.430	-2.90
$Capital_{t-1}$	0.016	0.12	-0.108	-0.44
Firm fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
R^2	0.7927			
N	17,859		17,859	

Panel C: Speed of Adjustment using the Faulkender et al. (2012) OLS specification: $Delta_t - Delta_{t-1} = \alpha + \lambda * (Target\ Delta_{t-1} - Delta_{t-1})$ where $\lambda =$ Speed of Adjustment.

Dependent Variable =	Change of Delta		Change of Delta	
	(1)		(2)	
	Coefficient	t-value	Coefficient	t-value
Intercept	-0.035	-6.85	-0.069	-6.27
Delta Gap	0.434	24.31		
Positive Delta Gap (β_1)			0.495	19.58
Negative Delta Gap (β_2)			0.366	12.81
p-value for testing $\beta_1 = \beta_2$			0.0001	
R^2	0.0952		0.0963	
N	17,859		17,859	

Panel D: Cross Sectional Analyses of Speed of Adjustment

Dependent Variable =	Change of Delta									
	(1)		(2)		(3)		(4)		(5)	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Intercept	0.050	6.54	-0.005	-0.54	-0.006	-0.25	0.046	8.44	0.077	10.18
Delta Gap	0.358	19.19	0.366	15.90	0.278	5.85	0.309	19.78	0.277	12.59
Delta Gap * CV	0.093	3.35	0.105	3.66	0.098	1.99	0.149	3.01	0.199	6.16
CV	-0.039	-3.51	-0.012	-0.98	0.082	3.28	-0.056	-1.78	-0.051	-4.62
Cross sectional variable (CV)	High Analyst Following		High Institution Ownership		Board Independence		Early CEO Tenure		Product Market Competition	
R^2	0.1115		0.0960		0.1288		0.0868		0.1135	
N	17,859		17,859		11,816		17,859		16,286	

Table 5 Deviation from Optimal Incentives and Earnings Management (DA Measure)

In Panel A we estimate partial correlations between discretionary accruals (DA) and both predicted incentives and residual incentives; Predicted Delta is predicted value using the estimated coefficients and Residual Delta is the regression residual from the estimation in Table 2, Panel A, column (2). In Panel B we estimate relations between DA and Residual Delta controlling for Residual Vega. Panel C separates Residual Delta into positive and negative components where Positive Residual Delta = Residual Delta when Residual Delta > 0, and zero otherwise; and Negative Residual Delta = Residual Delta when Residual Delta < 0, and zero otherwise. Sample period covers 1992-2015. See appendix for variable definition and measurement. The OLS regressions are estimated clustered by firm. The OLS regressions are estimated clustered by firm. Standard errors are bootstrapped to account for generated regressors. All right hand side variables are one year lagged.

Panel A: Partial Correlations of Predicted Incentives and Residual Incentives with DA

Dependent Variable =	DA_t	
	Coefficient	t-value
Intercept	-0.014	-2.94
Predicted $Delta_{t-1}$	0.001	1.28
Residual $Delta_{t-1}$	0.005	5.13
NOA_{t-1}	0.002	2.02
Firm Age_{t-1}	0.000	3.18
$Intangible_{t-1}$	-0.058	-4.51
STD_CF_{t-1}	-0.062	-1.76
STD_Sale_{t-1}	-0.012	-1.50
R^2	0.0103	
N	17,631	

Panel B: Relation between Residual Delta and DA – controlling for residual vega

Dependent Variable =	DA_t	
	Coefficient	t-value
Intercept	0.040	2.16
Residual $Delta_{t-1}$	0.005	4.34
Residual $Vega_{t-1}$	0.000	-0.25
ROA_{t-1}	-0.083	-5.11
$Size_{t-1}$	-0.005	-5.18
BM_{t-1}	-0.006	-1.63
$Leverage_{t-1}$	0.009	1.42
NOA_{t-1}	0.004	2.68
Firm Age_{t-1}	0.000	6.37
$Return_{t-1}$	-0.001	-0.54
$Capital_{t-1}$	-0.003	-0.45
$Intangible_{t-1}$	-0.079	-4.04
STD_CF_{t-1}	-0.120	-3.04
STD_Sale_{t-1}	-0.015	-1.70
Industry fixed effects	Yes	
Year fixed effects	Yes	
R^2	0.0401	
N	17,633	

Panel C: Asymmetry of Relation between Positive and Negative Residual Delta and DA

Dependent Variable =	DA_t	
	Coefficient	t-value
Intercept	0.041	2.22
Positive Residual Delta $_{t-1}$ (β_1)	0.006	2.92
Negative Residual Delta $_{t-1}$ (β_2)	0.001	0.57
Residual $Vega_{t-1}$	0.000	-0.30
ROA_{t-1}	-0.082	-5.08
$Size_{t-1}$	-0.005	-5.17
BM_{t-1}	-0.006	-1.57
$Leverage_{t-1}$	0.009	1.41
NOA_{t-1}	0.004	2.45
Firm Age_{t-1}	0.000	5.95
$Return_{t-1}$	-0.001	-0.35
$Capital_{t-1}$	-0.004	-0.51
$Intangible_{t-1}$	-0.079	-4.02
STD_CF_{t-1}	-0.116	-2.86
STD_Sale_{t-1}	-0.015	-1.69
Industry fixed effects	Yes	
Year fixed effects	Yes	
p-value for testing $\beta_1 = \beta_2$	0.0457	
R^2	0.0395	
N	17,633	

Table 6 Cross Sectional Analyses: Deviation from Optimal Incentives and Earnings Management (DA Measure)

In this table, we examine how the relation between residual incentives and earnings management is affected by cross sectional variables: analyst following, institutional ownership, board independence, Early CEO tenure, and product market competition. Positive Residual Delta = Residual Delta when Residual Delta > 0, and zero otherwise; and Negative Residual Delta = Residual Delta when Residual Delta < 0, and zero otherwise. The sample period covers 1992-2015 except for board independence which covers 1999-2013. Control variables are those used in Panel C of Table 5. See appendix for variable definition and measurement. The OLS regressions are estimated clustered by firm. t-values are presented in parentheses. Standard errors are bootstrapped to account for generated regressors. All right hand side variables are one year lagged.

Dependent Variable =			DA_t		
	(1)	(2)	(3)	(4)	(5)
Intercept	0.036	0.046	0.055	0.034	0.033
	(2.11)	(2.81)	(3.34)	(2.23)	(2.29)
Positive Residual Delta (β_1)	0.017	0.012	0.023	0.008	0.007
	(6.05)	(5.04)	(4.11)	(3.01)	(2.23)
Negative Residual Delta (β_2)	-0.002	-0.003	-0.003	0.002	0.001
	(-0.88)	(-1.31)	(-0.51)	(0.82)	(0.38)
Positive Residual Delta * CV (β_3)	-0.011	-0.017	-0.019	0.012	0.013
	(-2.54)	(-4.16)	(-2.79)	(2.81)	(3.07)
Negative Residual Delta * CV (β_4)	0.002	0.005	0.004	-0.003	0.006
	(0.46)	(1.46)	(0.69)	(-0.63)	(1.57)
Controls	Yes	Yes	Yes	Yes	Yes
Cross sectional variable (CV) =	High Analyst Following	High Institution Ownership	Board Independence	Early CEO Tenure	Product Market Competition
p-value for testing $\beta_1 = \beta_2$	0.0001	0.0001	0.0076	0.0465	0.0421
p-value for testing $\beta_3 = \beta_4$	0.0389	0.0003	0.0308	0.0452	0.0431
p-value for testing $\beta_1 + \beta_3 = 0$	0.1033	0.1344	0.1458		
R^2	0.0387	0.0432	0.0426	0.0433	0.0363
N	17,633	17,633	11,363	17,633	15,717

Table 7 Deviation from Optimal Incentives and Earnings Management (AAER)

This table examines relations between residual incentives and AAER using Logit regression. In Panel A we estimate partial correlations between AAER and both predicted incentives and residual incentives; Predicted Delta is predicted value using the estimated coefficients and Residual Delta is the regression residual from the estimation in Table 2, Panel A, column (2). In Panel B we estimate relations between AAER and Residual Delta controlling for Residual Vega. Panel C separates Residual Delta into positive and negative components where Positive Residual Delta = Residual Delta when Residual Delta > 0, and zero otherwise; and Negative Residual Delta = Residual Delta when Residual Delta < 0, and zero otherwise. Sample period covers 1992-2015. See appendix for variable definitions and measurement. The Logit regressions are estimated clustered by firm. Standard errors are bootstrapped to account for generated regressors.

Panel A: Partial Correlations of Predicted Incentives and Residual Incentives with AAER

Dependent Variable =	$AAER_t$	
	Coefficient	z-value
Intercept	-3.907	-6.91
Predicted $Delta_{t-1}$	-0.001	-0.01
Residual $Delta_{t-1}$	0.482	2.75
NOA_{t-1}	-0.046	-0.37
Firm Age_{t-1}	-0.006	-0.73
$Intangible_{t-1}$	1.335	1.37
STD_CF_{t-1}	-0.211	-0.07
STD_Sale_{t-1}	-0.033	-0.05
R^2	0.002	
N	17,035	

Panel B: Relation between Residual Delta and AAER – controlling for residual vega

Dependent Variable =	$AAER_t$	
	Coefficient	z-value
Intercept	-19.282	-17.43
Residual $Delta_{t-1}$	0.406	2.69
Residual $Vega_{t-1}$	0.029	0.59
ROA_{t-1}	-1.752	-1.76
$Size_{t-1}$	0.387	4.44
BM_{t-1}	0.594	1.58
$Leverage_{t-1}$	0.247	0.41
NOA_{t-1}	-0.071	-0.46
Firm Age_{t-1}	-0.009	-1.27
$Return_{t-1}$	-0.053	-0.34
$Capital_{t-1}$	-1.810	-2.35
$Intangible_{t-1}$	-0.585	-0.44
STD_CF_{t-1}	2.145	0.72
STD_Sale_{t-1}	-0.435	-0.62
Industry fixed effects	Yes	
Year fixed effects	Yes	
Pseudo R^2	0.1414	
N	17,633	

Panel C: Asymmetry of Relation between Positive and Negative Residual Delta and AAER

Dependent Variable =	$AAER_t$	
	Coefficient	z-value
Intercept	-19.618	-23.19
Positive Residual Delta $_{t-1}$ (β_1)	0.874	3.20
Negative Residual Delta $_{t-1}$ (β_2)	0.032	0.19
Residual $Vega_{t-1}$	0.038	0.77
ROA_{t-1}	-1.689	-1.70
$Size_{t-1}$	0.381	4.35
BM_{t-1}	0.607	1.63
$Leverage_{t-1}$	0.269	0.44
NOA_{t-1}	-0.079	-0.51
Firm Age_{t-1}	-0.009	-1.22
$Return_{t-1}$	-0.104	-0.65
$Capital_{t-1}$	-1.821	-2.35
$Intangible_{t-1}$	-0.627	-0.47
STD_CF_{t-1}	2.059	0.70
STD_Sale_{t-1}	-0.487	-0.70
Industry fixed effects	Yes	
Year fixed effects	Yes	
p-value for testing $\beta_1 = \beta_2$	0.0220	
Pseudo R^2	0.1445	
N	17,633	

Table 8 Cross Sectional Analyses: Deviation from Optimal Incentives and Earnings Management (AAER)

In this table, we examine how the relation between residual incentives and AAER is affected by cross sectional variables: analyst following, institutional ownership, board independence, CEO tenure, and product market competition. Positive Residual Delta = Residual Delta when Residual Delta > 0, and zero otherwise; and Negative Residual Delta = Residual Delta when Residual Delta < 0, and zero otherwise. The sample period covers 1992-2015 except for board independence which covers 1999-2013. Control variables are those used in Panel C of Table 8. See appendix for variable definition and measurement. The Logit regressions are estimated clustered by firm. z-values are presented in parentheses. Standard errors are bootstrapped to account for generated regressors. All right hand side variables are one year lagged.

Dependent Variable =	$AAER_t$				
	(1)	(2)	(3)	(4)	(5)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Intercept	-19.834	-19.651	-19.185	-19.608	-20.231
	(-17.54)	(-17.94)	(-13.78)	(-17.85)	(-11.07)
Positive Residual Delta (β_1)	0.887	0.581	1.029	0.909	1.383
	(2.85)	(2.09)	(2.58)	(2.86)	(3.64)
Negative Residual Delta (β_2)	-0.422	0.187	-0.399	0.017	-0.075
	(-1.04)	(0.82)	(-1.36)	(0.09)	(-0.32)
Positive Residual Delta * CV (β_3)	-1.161	-1.241	-0.982	3.982	1.919
	(-2.70)	(-2.31)	(-1.99)	(4.43)	(3.25)
Negative Residual Delta * CV (β_4)	0.419	-0.037	0.466	0.596	-0.130
	(0.88)	(-0.11)	(1.24)	(1.32)	(-0.43)
Controls	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Corporate Governance =	High Analyst Following	High Institution Ownership	Board Independence	Early CEO Tenure	Product Market Competition
p-value for testing $\beta_1 = \beta_2$	0.0330	0.0482	0.0107	0.0322	0.0028
p-value for testing $\beta_3 = \beta_4$	0.0464	0.0481	0.0484	0.0032	0.0105
p-value for testing $\beta_1 + \beta_3 = 0$	0.4746	0.1910	0.9040		
Pseudo R^2	0.136	0.1384	0.1643	0.1691	0.1949
N	17,633	17,633	11,363	17,633	13,255

Table 9 Deviation from Optimal Incentives and Earnings Management - Change Model

In this table, we conduct a sensitivity test by using change model: change in discretionary accruals (DA) on lagged changes in Residual Delta. Residual Delta is the regression residual from the estimation in Table 2, Panel A, column (2). The sample period covers 1992-2015. See appendix for variable definition and measurement. The OLS regressions are estimated clustered by firm. Standard errors are bootstrapped to account for generated regressors.

Dependent =	ΔDA_t	
	Estimate	t-value
Intercept	-0.015	-1.77
ΔResidual $Delta_{t-1}$	0.009	3.86
ΔResidual $Vega_{t-1}$	0.000	0.50
$\Delta Size_{t-1}$	0.009	1.47
ΔBM_{t-1}	-0.030	-3.08
$\Delta Leverage_{t-1}$	0.078	3.49
ΔNOA_{t-1}	-0.005	-1.13
$\Delta Return_{t-1}$	0.015	4.74
$\Delta Capital_{t-1}$	0.048	1.59
$\Delta Intangible_{t-1}$	0.159	3.37
ΔSTD_CF_{t-1}	0.210	1.76
ΔSTD_Sale_{t-1}	-0.003	-0.09
Industry fixed effects	Yes	
Year fixed effects	Yes	
R^2	0.0153	
N	13,522	

Table 10 Sensitivity Test: One-step Regression of Accrual on Deviation from Optimal Incentives

Due to potential bias in both estimates and standard errors associated with DA variable used in two-step analyses (Chen, Hribar and Melessa, 2017), we consider directly the relation between accruals (without decomposing) and residual incentives using one-step regression. The sample period covers 1992-2015. See appendix for variable definition and measurement. See appendix for variable definition and measurement. The OLS regressions are estimated clustered by firm. The model specification is based on Jone's model and the standard errors are bootstrapped to account for generated regressors.

Dependent Variable =	Total $Accruals_t$	
	Coefficient	t-value
Intercept	-0.021	-3.87
Predicted $Delta_{t-1}$	-0.001	-1.47
Residual $Delta_{t-1}$	0.005	5.99
$\Delta SALE_t$	0.052	8.64
PPE_{t-1}	-0.054	-20.87
NOA_{t-1}	0.000	-0.10
Firm Age_{t-1}	0.000	12.49
$Intangible_{t-1}$	-0.097	-6.93
STD_CF_{t-1}	-0.058	-1.60
STD_Sale_{t-1}	-0.034	-3.87
R^2	0.1061	
N	17,631	