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Essays on the target setting in executive annual bonus contracts

최고경영자 연간 성과급 계약에 관한 연구

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권 세 원

Abstract

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My dissertation examines the determinants on the target setting of executive annual bonus contracts.

Prior research in managerial accounting has documented that external information, such as peer performance, is typically used in target setting. However, there is only limited evidence of what specific information is actually used in this process. My first essay examines how analysts' annual earnings forecasts influence target setting for executives' bonus contracts. I provide novel evidence that analyst forecasts are positively associated with firms' bonus target revisions. Furthermore, the use of analyst forecasts in target setting is less pronounced when the forecasts are noisier, and it is more prominent when analysts have an informational advantage over managers. I find that target ratcheting is attenuated for favorable performance and becomes severe for unfavorable performance when past performance is greater than analyst forecasts. Finally, the results from additional analyses are not consistent with alternative explanations that both bonus target revisions and analyst forecasts are influenced by internal planning information or that analyst forecasts are influenced by bonus target revisions (i.e., reverse causality).

Recent studies have suggested that annual bonus has an incentive effect comparable to stock compensation (Frydman and Jenter 2010; Jensen and Murphy 2011; Guay, Kepler, and Tsui 2016). However, only a limited number of papers have addressed annual bonuses. The aim of my second essay is 1) to overview the comprehensive landscape of executive bonus plans 2) and to investigate the determinants of pay-for-performance sensitivity (hereafter, "PPS") and the convexity of annual incentives. I find that the 80/120% rule for target setting holds on average, with differences across industries. I also show that firms' growth options are one of the key elements in determining bonus PPS and the convexity of bonus payouts after controlling for peer information and other economic factors.

Keyword : *Executive compensation; annual bonuses; analyst forecasts; performance targets; Pay-for-performance sensitivity; Pay convexity*

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Essay 1 : The Use of Analyst Forecasts in the Target Setting of Executive Annual Bonus Contracts

1. INTRODUCTION

Performance targets are a key component of firms' management control and compensation systems because the way firms set targets and revise them over time affect executives' incentives and hence firm value (Indjejikian and Nanda 2002). To motivate a firm's executives optimally, its performance targets should reflect the best estimate of expected performance that can be achieved under adequate levels of effort (Van der Stede 2000). Agency theory suggests that information asymmetry between firms and managers makes it difficult for firms to set accurate targets and firms rely on various set of information when setting and revising targets (Holmstrom 1979; Mittendorf and Zhang 2005).

The literature extensively documents that past performance is an importance source of information used to set targets. Firms increase targets following above-standard performance and reduce target following below-standard performance; this practice is called target ratcheting (Weitzman 1980). Yet the use of past performance in target setting introduces a dynamic incentive problem known as the "ratchet effect" because the ratcheting motivates managers to withhold effort in the current period to avoid difficult target in the future (Leone and Rock 2002; Bouwens and Kroos 2011). Theories suggest that firms can alleviate this incentive problem if they can ex ante commit not to use information about past performance when setting future targets (Laffont and Tirole 1993). Consistent with this argument, empirical studies provide evidence that firms do not fully incorporate executives' past performance in setting their future targets (Indjejikian and Nanda 2002; Aranda, Arellano, and Davila 2014; Indjejikian Matějka, Merchant, and Van der Stede 2014a; Bol and Lill 2015). While these findings are consistent with the benefit of a long-term contractual commitment, theories also point out that firms can benefit ex post if they renege on this commitment and use information about past performance in setting targets (Milgrom and Roberts 1992).

Given this complex incentive effects associated with using past performance in target setting and its limited ability to predict future performance, past performance is usually complemented by other sources of information. Academic literature on target setting provides only limited evidence on the use of other sources of information beyond past performance. Aranda et al. (2014) examine the use of peer performance information in target setting based on data of a retail travel company and find that supervisors use information about the relative performance of comparable branches to revise targets. Bouwens and Kroos (2016) show that firms use non-financial information such as customer services in target setting because the information is informative about future performance. Based on survey data, Dekker, Groot, and Schoute (2012) report that internal planning information is also widely used in target setting, along with past information, and the use of internal benchmarking (i.e., comparison of units within the firm) and external benchmarking (i.e., comparison between firms) is relatively limited.

While these findings provide insights into the use of various information sources beyond past information in target setting for business units of an organization (Aranda et al. 2014; Bouwens and Kroos 2016) and for middle-level managers (Dekker et al. 2012), the literature has not explored what types of other information sources are used and how these information sources are interrelated for target setting of top executives of largest firms, due to a lack of publicly available data on performance target.

Anecdotal evidence suggests that firms increasingly use externally determined standards in target setting in recent years because they are more transparent and are less likely to be influenced by managers than internally determined standards, such as past performance and internal business plan (Mercer 2009; Indjejikian, Matějka, and Schloetzer 2014b). For example, the 2007 survey by Mercer (2009) indicates that 55% of participating firms use "externally informed absolute" numbers to set short-term incentive targets.

In this study, I focus on the use of externally determined standards in the target setting of executive annual bonus contracts. Externally determined standards, in the form of analysts' consensus estimates, are readily available for listed firms, and they provide forward-looking and firm-specific estimate of expected performance that are determined externally, reflecting an additional information set as a results of analysts' own research. Therefore, externally determined standards satisfy the informativeness criterion of Holmstrom (1979). Mittendorf and Zhang (2005) provide additional rationale for the use of analyst forecasts in target setting. They analytically show that the principal (owner) benefits from relying on analysts' forecasts to achieve optimal contracts even when agent (manager)'s guidance based on her private observation of earnings is available. This is because analysts conduct their own research effort in the presence of 'biased' earning guidance and thus act as information intermediaries to discipline the agent. Other practical reason to incorporate information about externally determined standards is the increasing importance of meeting or beating expectations (MBE) in firm valuation and the job security of executives (Graham, Harvey, and Rajgopal 2005). Firms are likely to incorporate information about external targets in setting internal target in compensation if firms want to motivate managers to meet or beat the external target.

I examine whether firms use externally determined standards in revising targets in bonus contracts using performance target data of S&P 1500 firms, collected from the compensation discussion and analysis (CD&A) section of proxy statements. I focus on earnings per share (EPS) targets in executive annual bonus contracts because earnings are among the most widely used performance measures (Kaplan and Atkinson 1989; O'Byrne 1990; Watts and Zimmerman 1986; Graham et al. 2005). As an empirical proxy for externally determined standards, I use the consensus of analysts' annual earnings forecasts that are available to compensation committees before the approval date of the annual bonus plan.

Using the sample of 1,051 firm-year observations for fiscal years 2008 through 2014, I find a significant relation between externally determined standards (i.e., the consensus analyst forecast) and firms' bonus target revisions (Indjejikian et al. 2014b). To control for other factors considered in target revisions (Indjejikian et al. 2014b), I include past performance, peer performance, expected growth, and other control variables in my empirical model (Aranda, Arellano, and Davila 2014; Kim and Shin 2016). I find that while both factors play a significant role in explaining target revisions, they are no longer significant once analyst forecast information is included in my target revision model, suggesting that analysts incorporate these factors into their forecasts.

Next, I conduct two cross-sectional tests to investigate under which circumstances the use of externally determined standards is more pronounced.

Based on the theory suggesting that the relative weight on each information source depend on its informativeness (Holmstrom 1979), I predict that firms place more emphasis on externally determined standards when they are more informative. First, I use analysts' forecast accuracy and forecast dispersion and test whether the use of externally determined standards increases when they are perceived to be more accurate and less nosy. Second, I examine whether the use of externally determined standards increases when analysts' information advantage over managers is pronounced. Hutton, Lee, and Zhou (2012) find that analyst forecasts are more accurate than management forecasts 50% of the time and the information advantage of analysts over management comes from analysts' expertise on macroeconomic factors. Specifically, when firm performance is strongly linked to macroeconomic factors such as gross domestic product (GDP), energy prices, and regulations, analyst forecasts are more accurate than management forecasts. Therefore, I predict that the use of externally determined standards in target setting is more pronounced when firm performance is heavily influenced by GDP. The empirical findings are consistent with my predictions.

I then examine how externally determined standards influence the extent to which targets are ratcheted. Prior studies document that firms adjust the extent of target ratcheting based on whether past performance reflects permanent or transitory component of performance (Aranda et al. 2014). The extent of target ratcheting also differs between well-performing managers and poorly performing managers in a way that upward (downward) target revisions following good (bad) performance are limited (common) for well-performing managers (Indjejikian et al. 2014 a and b; Bol and Lill 2015). I expect that firms can use externally determined standards as an objective benchmark to distinguish between permanent and transitory components of performance or to distinguish between well-performing and poorly performing managers. I find that, when past performance is above the prior-period external targets, the magnitude of ratcheting decreases for favorable performance variance because firms infer that favorable performance is the result of managers' extra effort or transitory shocks, both of which are not sustainable in the future. Similarly, the magnitude of ratcheting for unfavorable performance variance increases when past performance is above the prior-period external targets, because firms are eager to retain well-performing managers' superior ability (Indjejikian et al. 2014a).

In summary, my results suggest that firms use externally determined standards in revising targets above and beyond past performance and peer performance information. The extent of the use of externally determined standards depends on their informativeness, and they also affect the use of past information in revising targets.

To check the validity of my inferences, I examine several alternative explanations. It is possible that the positive association between externally determined standards and firms' bonus target revisions merely reflects internal planning information (e.g., management forecasts) that has been communicated to both analysts and compensation committees. Internal planning information is likely to be an important source in target setting because it incorporates managers' private and forward-looking information (Dekker et al. 2012), and the information often communicated to analysts, commonly in the form of management forecasts. However, future planning information is determined by managers themselves, thereby being subject manipulation and game playing because of information asymmetry between firms and managers (Mittendorf and Zhang 2005). For example, Anderson, Dekker, and Sedatole (2010) document that the introduction of a performance-based bonus plan is associated with goals being set at the lower level and managers adjust their performance just to meet the goal. Given these benefits and costs of internal planning information, its relative importance in target setting, in the presence of externally determined standards, is an empirical question.

To evaluate the possibility that internal planning information is an underlying force in my results, I conduct several tests using management forecasts as a proxy for internal planning information. First, I include management earnings forecasts in my baseline model in order to examine the ability of internal planning information to explain target revisions. When management forecasts are included in a model without analyst forecasts, the coefficients on management forecasts are positive and significant, indicating that management forecasts are considered in target setting. However, when both management and analyst forecasts are included in the model, only the coefficient on analyst forecasts remains significantly positive. This suggests that analyst forecasts are more informative in explaining target revisions. Second, to rule out any chance that my results merely reflect the effect of management forecasts on analyst forecasts, I re-estimate my regression using the subsample without management forecasts. I also measure analyst forecasts issued over the period *prior to* the issuance of management forecasts for the subsample with them. The coefficients on analyst forecasts continue to be significantly positive in these tests, ruling out this alternative explanation. Finally, I measure analyst forecasts issued over the period *after* the issuance of management forecasts. I find that the coefficient on analyst forecasts that may have been walked-down or walked-up remains significantly positive, while that on management forecasts is insignificant. Taken together, it is less likely that my results are simply picking up the information in internal planning.

Another potential concern is that my results may reflect that analysts update their forecasts based on internal bonus targets set by the board (i.e., reverse causality). I believe that my use of forecasts issued *before* the approval date of the annual bonus plan in main tests mitigates this concern.[1] But I examine this possibility by looking at analyst forecast revisions around the bonus plan approval dates. Specifically, I check whether individual analysts revise their forecasts upward (downward) after the approval date when bonus targets are set higher (lower) than their own previous forecasts. I find no such evidence and therefore believe my results are not driven by reverse causality.

This paper makes several contributions to the literature on target setting. First, I provide empirical evidence on the use of externally determined standards in target setting and therefore directly answer the call by Indjejikian et al. (2014b) to examine the use of externally informed performance targets in the recent target-setting practices. My findings complement Aranda et al. (2014) by extending the sources of information in target setting beyond the past performance and relative target setting.

Second, I use a sample of large U.S. firms to provide insights into the

[1] Furthermore, bonus plan details are not typically publicly available until proxy statements are disclosed. Nevertheless, it is possible that managers are implicitly communicating this information to analysts in order to manage expectations and make beating the forecasts easier after the plan has been approved by the board.

target-setting process for CEOs' annual bonus in recent years. Before the SEC's new disclosure rule was introduced in 2006, performance targets in bonus contracts were typically regarded as unobservable (Indjejikian and Nanda 2002). As a result, most prior studies have relied on target bonus data to draw inferences about performance targets (Holthausen, Larcker, and Sloan 1995; Indjejikian and Nanda 2002) or used target data of business units of a single firm in the context of budgeting or bonus pay (Leone and Rock 2002; Bol, Keune, Matsumura, and Shin 2010; Anderson et al. 2010; Bouwens and Kroos 2011; Aranda et al. 2014; Bol and Lill 2015).[2] However, whether these earlier findings can be applied to the target setting of top executives of listed firms is unclear. For example, externally determined performance standards are only available for firm-level performance, not for the performance of business units. In addition, while the benefit of internal benchmarking is clear for business units conducting homogeneous businesses, the feasibility and prevalence of external benchmarking has been in question due to the limited data about industry peer performance and the subjective nature of peer group selection (Hansen, Otley, and Van der Stede 2003; Dekker et al. 2012). Therefore, my study examines the issue about the use of external performance standard, which cannot be explored using business unit data.

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[2] Kim and Shin (2016) is an exception. They use S&P 1500 firms from 2006 through 2014 to provide the first large-sample evidence of bonus target ratcheting.

Third, my study contributes to the literature on target ratcheting by documenting that externally determined standards affects the extent of target ratcheting because they help firms to measure well-performing managers or transitory components of performance. My results are thus directly related to a suggestion by Indjejikian et al. (2014b) to consider alternative benchmarks to identify well-performing managers. Furthermore, I complement Aranda et al.'s (2014) finding that relative target setting (RTS) affects the extent of target ratcheting.

Finally, my study also furthers my understanding of the relation between internal and external performance targets. Prior research has generally assumed that firms consider internal targets (for bonus determination) and external targets (for meeting market expectations) separately and that there is little interaction between the two.[3] For example, Matsunaga and Park (2001, 314) argue that "the effect of missing a quarterly earnings benchmark on a CEO's bonus is likely to result from the compensation committees' exercise of their discretion in the allocation of the bonus pool, as opposed to the benchmark's being an explicit component of the plan." However, my evidence that boards update internal bonus targets based on external consensus suggests that boards *ex ante*

[3] CFOs surveyed in Graham et al. (2005) indicate that boards set internal targets higher than external to ensure that external targets are not difficult to attain. However, Armstrong et al. (2017) report that external targets exceed the internal EPS targets in 60% of their sample.

incorporate external benchmark into an internal target-setting process, rather than making discretionary adjustments *ex post*.

The remainder of this paper proceeds as follows. Section 2 reviews prior literature and develops my hypotheses. I describe my sample and research design in Section 3, and present descriptive statistics in Section 4. Section 5 reports my empirical results, and Section 6 contains additional analyses. Section 7 concludes.

2. RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

Performance targets serve as an important basis for business decision making, such as choosing investments and evaluating performance (Ittner and Larcker 2001). The goal of performance targets in incentive contracts is to provide managers incentive to increase firm value, while simultaneously paying competitive expected levels of compensation (Murphy 2001). Therefore, setting adequate level of performance standards is important to optimally motivate managers. For example, Murphy (2001) argues that less accurate performance targets increase the compensation risk of managers and thereby result in higher levels of pay. Given information asymmetry between firms and managers (Homlstrom 1979; Mittendorf and Zhang 2005), firms rely on several sources of information to set the adequate levels of performance. Firms decide the relative weights to put on each source based on the trade-offs among the information collection cost, the ability to predict future performance (i.e., accuracy or informativeness), and the extent to which managers can influence the measure (Murphy 2001).

The literature identifies past performance, internal planning, and benchmarking information as important information sources (Dekker et al. 2012). Past performance information is widely used for target setting because it is readily available and is informative about future performance. Firms typically increase targets following above-standard past performance and reduce target following below-standard performance, and this process is called 'target ratcheting' (Weitzman 1980; Leone and Rock 2002). The magnitude of the adjustment after favorable variance is greater than that after unfavorable variance, suggesting an asymmetry in ratcheting (Leone and Rock 2002; Kim and Shin 2016). The target ratcheting has negative incentive effects because managers are motivated to withhold their effort in the current period to avoid difficult targets in the future (i.e., the ratchet effect). Firms can address this adverse consequence of ratcheting by making a contractual commitment to disregard information about past performance when setting future targets (Laffont and Tirole 1993). Consistent with the theory, there is empirical evidence that performance-target deviation is serially correlated, suggesting that firms do not fully incorporate information about past performance in the target revision process (Indjejikian and Nanda 2002; Aranda, Arellano, and Davila 2014; Indjejikian et al. 2014a; Bol and Lill 2015). For example, Indjejikian et al. (2014a) find that target revisions for well-performing managers are sensitive to past unfavorable performance variance and are less sensitive to past favourable performance variance, suggesting that firms reward well-performing managers with rents. While these findings are consistent with the benefit of long-term contractual commitment to address the ratchet effect, the commitment to disregard information about past information calls for more needs for other sources of information in target setting.

Past performance is typically complemented by internal planning information. Internal planning information is based on firms' business plan and budgets (Murphy 2001) and is potentially more informative about future performance than past performance because it incorporates managers' forward-looking information. Consistent with this conjecture, Dekker et al. (2012) report that internal planning information is extensively used in target setting to complement past performance information. However, internal planning information is determined by managers themselves, thereby being subject manipulation and game playing. In addition, because this information is typically used for multiple purposes such as coordinating or planning as well as performance evaluation, it is not clear whether this information reflects the best (unbiased) estimate of future performance. Anderson et al. (2010) document that the introduction of a performance-based bonus plan for stores of a U.S. retail firm is associated with goals being set at the lower level and that managers tend to just meet but not beat the target. The findings that managers influence the level of goals and the outcome are consistent with the argument that managers exploit the information asymmetry between them and supervisors to influence the levels of performance targets.

Murphy (2001) categorizes past performance and internal planning information as internally determined standards and argues that incentive problems arise from the use of internal planning standards in target setting because they are directly affected by management actions in the past or current periods. He finds that managers are more likely to smooth earnings when firms use internally determined standards.

There are also externally determined performance standards such as peer performance. Peers can be other divisions within a firm (i.e., internal benchmarking) or other firms in similar circumstances (i.e., external benchmarking). Information about peer performance can be used to assess the common component of performance across the peer group because their performances are subject to common shocks. Using peer information in target setting can also mitigate the negative incentive effect of ratcheting because peer performance is not affected by managers' actions. Aranda et al. (2014) use data of a retail travel company and find that supervisors use information about the relative performance of comparable branches in target setting. Bol and Lill (2015) show that the performance relative to peers (i.e., bank units) affects the degree of target ratcheting. Despite its theoretical appeal of using peer information in target setting, there is limited evidence on the prevalence of using peer information in practice, particularly for external benchmarking. This is because data about industry peer performance are often costly to obtain and only available with a time lag (Hansen et al. 2013). In addition, unlike internal benchmarking, external benchmarking requires the subjective choice of peer groups. Consistent with this argument, Dekker et al. (2012) report that external benchmarking is used to set the targets for middle-level managers much less than past performance or internal planning.

Another potential external source of information in target setting, particularly for top executives of listed firms, is externally determined standards. While externally determined standards, such as analysts' consensus estimates, exist mainly for capital market reasons, they could provide incremental information beyond past performance, internal planning, and peer information in the context of target setting. Externally determined standards provide a direct estimate of firm-specific performance; they incorporate forward-looking information; they are externally determined by third parties (i.e., analysts); they are readily available as long as the firm is followed by analysts; and they reflect the additional information set as a result of analysts' own research. Thus, in terms of the informativeness (Holmstrom 1979), externally determined standards should be useful in target setting to provide additional information.

Theory suggests another reason why externally determined standards can be useful in target setting in incentive contracts. Mittendorf and Zhang (2005) provide a principal-agent model in which the principal (owner) benefits from relying on analysts' forecasts to achieve optimal contracts, even when agent (manager)'s guidance based on her private observation of earnings is available. This is because analysts conduct their own research effort in the presence of 'biased' earning guidance and thus act as information intermediaries to discipline the agent. In other words, firms can improve the incentive contract by using the interaction between managers and analysts.

Another practical reason to incorporate information about externally determined standards is related to the increasing importance of meeting or beating expectations (MBE) in firm valuation. For example, prior studies document that meeting or beating analyst forecasts is associated with positive market premiums (Bartov, Givoly, and Hayn 2002; Kasznik and McNichols

2002). Missing forecasts, on the other hand, results in negative capital market consequences (Skinner and Sloan 2002; Brown and Sivakumar 2003). MBE also affects the job security of executives and the level of compensation (Graham et al. 2005). Matsunaga and Park (2001) find that missing quarterly forecasts negatively affects a CEO's annual bonus.[4] Armstrong, Chau, Ittner, and Xiao (2017) suggest that CEOs have stronger incentives to achieve external EPS targets than to achieve internal targets because their equity-based incentives are more important than their bonus. Therefore, if firms want to motivate managers to meet or beat the external target either to increase firm value or simply to align CEOs' equity and bonus incentives, firms are expected to incorporate information about external targets in setting internal target in compensation. Furthermore, firms may rely on externally determined standards to justify their performance targets in compensation designs to external stakeholders under extensive compensation disclosure requirements (Indjejikian et al. 2014b). Note that under these scenarios related to MBE or external pressures, firms' use of external targets does not depend on the informativeness of information. Therefore, if satisfying external targets and/or external pressure is the main driving force behind the use of external targets in target setting, it is not clear whether this practice can improve firms' incentive contracts (i.e.,

[4] Matsunaga and Park (2001) argue that the negative effect of missing quarterly targets on CEO compensation comes from the discretionary portion of the bonus controlled by the board.

informativeness of performance targets).

Anecdotal evidence supports the use of external performance standards in target setting. The 2014 proxy statement of Biogen Inc., for example, states that the firm considers analyst forecasts in setting annual goals, in addition to internal forecasts and peer performance (See Appendix A for details). Practitioners also recommend the use of externally determined standards. Mercer (2009), for example, provides the analysts' expectations an important source of external information because they can be used to 'assess the degree of difficulty built into performance targets'.

In summary, externally determined standards, such as analysts' consensus estimates, are informative about future firm performance and firms can exploit the disciplinary role of analysts to improve the incentive contracts (Mittendorf and Zhang 2005). In addition, the emphasis on MBE and the pressures from external stakeholders for transparent and accountable compensation design also contribute the use of externally determined standards. Despite this wealth of anecdotal evidence and theoretical support for the use of externally determined standards in target setting, there remains little research on the topic. I attempt to fill this void. My first hypothesis is stated as follows:

H1*: Analyst forecast information is used when boards revise performance targets in executive bonus contracts.*

I may not find evidence consistent with my hypothesis if firms consider externally determined standards not providing incremental information about future firm performance beyond other available information sources such as managers' own expectations (e.g., management forecasts). However, Hutton et al. (2009) documents that analysts' forecasts are more accurate than management's forecasts about 50% of the time, contrary to a common belief that managers always know better than analysts. Furthermore, Holmstrom (1979) suggests that even imperfect and noisy information can increase the contracting efficiency as long as the information is incrementally informative about future performance. Therefore, I expect that firms incorporate information about externally determined standards into setting and revising targets.

The first hypothesis raises the next question: *Under which circumstances is the use of externally determined standards more pronounced?* Murphy (2001) provides three criteria to evaluate each of information sources in target setting: information collection cost, accuracy, and extent to which the information is influenced by managers. Assuming that cost of collecting externally determined standards is low and they are determined by third party, the weight firms put on externally determined standards is expected to depend on their relative accuracy or informativeness (Holmstrom 1979). Specifically, firms determine salary and pay-performance sensitivity to satisfy managers' reservation wage, while providing managers incentive, and their optimal combination is based on the accuracy of performance standards. Therefore, by using more accurate performance standards (e.g., those with lower variance), thus firms can either reduces the base salary while maintaining current pay-performance sensitivity or increase pay-performance sensitivity at the same level of salary (Murphy 2001).

This argument is similar to the theory about the choice of performance measures in incentive contracts that the weights of particular measures are negatively correlated with their noise. For example, Banker and Datar (1987) show that weights on each performance measure are inversely related to the variance of each measure. Similarly, Ittner, Larcker, and Rajan (1997) document that noise in financial measures influences the weights on non-financial measures.

Based on the discussion, I expect firms to allocate more weights on externally determined standards when they are more accurate and less noisy. I use two approaches to test this prediction. First, I use analyst' forecast accuracy and forecast dispersion to proxy for accuracy/noisiness of externally determined standards. I predict that firms with more accurate and less dispersed forecasts are more likely to use analyst forecasts, compared to firms with less accurate and more dispersed forecasts. While intuitive, this approach has a limitation that forecast accuracy and dispersion may simply reflect the overall environmental uncertainty of the firm (e.g., volatile business). What I am more interested in is the "relative" informativeness of analyst forecasts compared to other sources, such as managers' private information and where that relative advantage of analyst forecasts come from. To address this issue, I rely on a prior study on the relative information advantage of analysts versus managers. Hutton et al. (2012) examine in what circumstances analysts' forecasts are more accurate than managers' forecasts and find that analysts' information advantage comes from their ability to assess macroeconomic factors; analyst forecasts are more accurate than management forecasts for firms whose earnings are highly exposed to macroeconomic factors, such as GDP. On the other hand, managers' relative information advantage comes from their ability to make decisions to respond to unusual operation situations because analysts find it difficult to anticipate those actions. Hutton et al. (2012) find no difference between analysts and managers in terms of the ability to understand industry-level shocks. Based on these findings, I predict that firms put more weight on analyst forecasts in target setting when firm performance is closely correlated with macroeconomic factors, in which analysts have an information advantage over managers. Results from this test will help us to pinpoint the source of relative informativeness of analyst forecasts.

Therefore, my second and third hypotheses are stated as follows:

***H2**: The use of analyst forecasts in the revision of target setting is more pronounced when analyst forecasts are more accurate and less dispersed.*

***H3**: The use of analyst forecasts in the revision of target setting is more pronounced when firm performance is more highly exposed to macroeconomic factors.*

While previous hypotheses are mainly concerned with the extent to which firms use externally determined standards in revising executive bonus targets, I argue that externally determined standards could also influence the extent to which targets are ratcheted. Recent literature on target ratcheting provides evidence that upward (downward) target revisions following good (bad) performance are limited (common) for well-performing managers (Indjejikian et al. 2014 a and b; Aranda et al. 2014; Bol and Lill 2015). These studies invariably rely on peer performance (e.g., performance above peers or performance above the industry median profitability) as a benchmark to identify well- (poorly) performing managers.

Externally determined performance targets, such as analyst forecasts, can be also used as an alternative benchmark to distinguish between well-performing and poorly performing managers and also to distinguish between transitory gains and permanent gains (Indjejikian et al. 2014b). Prior research documents that firms frequently rely on analyst forecasts to evaluate their CEOs' performance. Matsunaga and Park (2001) find that missing quarterly analyst forecasts is associated with lower CEO annual bonuses. Farrell and Whidbee (2003) document that firms focus on the deviation from analyst forecasts, rather than on earnings performance itself, in making CEO turnover decisions. Consequently, firms are likely to use not only industry peer performance but also externally determined standards when identifying well-performing and poorly performing managers.

Externally determined standards can be also useful as an objective benchmark to distinguish firms' permanent component of performance from transitory component of performance. When actual performance is greater than the external target, firms can infer that favorable performance is the results of superior effort of managers or transitory shock. Firms therefore allow their CEOs to reap economic rents from favorable performance by not revising targets upward following favorable performance. Similarly, when actual performance is greater than the external target, firms allow their CEOs to be protected from the effect of unfavorable performance by revising targets downward following unfavorable performance. The opposite will be the case when actual performance is lower than the external target. Therefore, I predict that, when past performance is above the prior-period external targets, the magnitude of ratcheting decreases for favorable performance variance and the magnitude of ratcheting for unfavorable performance variance increases. In sum, my fourth hypothesis is stated as follows:

***H4**: The difference between past performance and externally determined standards is associated with the magnitude of target ratcheting and ratcheting asymmetry.*

3. SAMPLE AND RESEARCH DESIGN

Sample

My initial sample consists of S&P 1500 firms for fiscal years 2008-2014. I focus on firms that use EPS as a performance measure in their executive annual bonus contracts because it is the most widely used measure. I hand-collect EPS performance targets and actual EPS performance from the CD&As of proxy statements. Detailed information on each plan is disclosed in the "Short-term Incentives" section. Appendix B provides an example of a CD&A section of proxy statement for the El Paso Electronic Company. This company provides information about the performance measures of its annual bonuses (EPS with 50% weight), performance targets ($2.30), and actual performance ($2.27) for 2014.

I obtain stock return data from CRSP and financial data from Compustat. I collect analyst forecast data from I/B/E/S. All variables are winsorized at the top and bottom 1% levels.

Table 1 summarizes my sample selection procedure. Among the S&P 1500 firms during my sample period, I find 2,723 firm-years for which EPS was used as a performance measure for bonus contracts. I exclude firm-years that lack EPS target information, as well as those with missing analyst forecast information and control variables.[5] Because my main regression model requires EPS target and performance data for at least two consecutive years, I further exclude firm-years that lack such data. My final sample consists of 1,051 firm-year observations.

(Table 1 here)

Research Design

I estimate the following baseline regression to test Hypothesis 1, i.e., whether analyst forecasts are incorporated in a board's target-setting process:

$$\begin{aligned} \textit{Target revision}_{i,t+1} = {} & \lambda_0 + \lambda_1 \textit{ Target deviation}_{i,t} \\ & + \lambda_2 \textit{ Target deviation}_{i,t} * \textit{D\_NEG}_{i,t} + \lambda_3 \textit{ Analyst forecast dev}_{i,t+1} \\ & + \lambda_4 \textit{ D\_NEG}_{i,t} + \lambda_5 \textit{ Relative-to-peers}_{i,t} + \lambda_6 \textit{ Growth}_{i,t+1} \\ & + \lambda_7 \textit{ Ret}_{i,t} + \textit{Year and industry fixed effects} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

The dependent variable is $\textit{Target revision}_{i,t+1}$, which is defined as ($\textit{Target EPS}_{i,t+1}$ − $\textit{Target EPS}_{i,t}$) divided by $\textit{Target EPS}_{i,t}$, and $\textit{Target deviation}_{i,t}$ is a proxy for past actual performance relative to the target, defined as ($\textit{Actual EPS}_{i,t}$ − $\textit{Target EPS}_{i,t}$) divided by $\textit{Target EPS}_{i,t}$. To capture any asymmetry in the

[5] If a stock split occurs during the year, I exclude that firm-year observation from my sample.

ratcheting, I include an indicator variable for unfavorable performance variances, $D\_NEG_{i,t}$, and its interaction with $Target\ deviation_{i,t}$ (Leone and Rock 2002; Kim and Shin 2016). $D\_NEG_{i,t}$ equals 1 if $Target\ deviation_{i,t}$ is negative, and 0 otherwise.

My main variable of interest is $Analyst\ forecast\ dev_{i,t+1}$, which is defined as ($Analyst\ forecast_{i,t+1}$ − $Actual\ EPS_{i,t}$) divided by $Target\ EPS_{i,t}$. $Analyst\ forecast_{i,t+1}$ is the average of the most recent forecasts of year *t*+1 earnings issued over the period from the announcement of year *t* earnings to the approval date[6] of the annual bonus plan for year *t*+1. If the approval date is missing, I use the end date of the three months after fiscal year-end as the approval date. Figure 1 illustrates the timeline of analyst forecasts used in my analyses.

(Figure 1 here)

Recent studies on target setting argue that managers' prior performance relative to peers influences their future targets, which underscores the importance of controlling for peer performance (Aranda et al. 2014; Indjejikian et al. 2014a; Indjejikian et al. 2014b; Bol and Lill 2015). Following these studies, I include a measure for a firm's relative performance compared to its peers ($Relative\text{-}to\text{-}peers_{i,t}$), which I define as the firm's basic EPS for year *t* less industry peers' average basic EPS for year *t*. I follow Albuquerque (2009) to

[6] The average approval date for annual bonus plans of year *t*+1 is 53 days after the end of fiscal year *t*.

construct industry-size-matched peer portfolios.[7] I also include firms' stock returns to control for events that are known to both target setting and analyst forecasts.[8] To the extent that stock returns reflect all available public information, controlling for stock returns can mitigate the possibility that my model is merely capturing the common information sets available to both analysts and boards. $Ret_{i,t}$ is the firm's stock returns over the 12-month period that ends three months after fiscal year-end t.

Indjejikian et al. (2014b) suggest that the relation between target revisions and past performance may be attributable to firm-specific growth. To control for the effect of firm-specific growth in target setting (Aranda et al. 2014; Indjejikian et al. 2014a; Indjejikian et al. 2014b; Kim and Shin 2016), I include anticipated growth in EPS ($Growth_{i,t+1}$) in my model. Specifically, I measure $Growth_{i,t+1}$ as the predicted value of the following model:

$$\begin{aligned} EPS\ growth_{i,t+1} = {} & \alpha_0 + \alpha_1\ Past\ EPS\ growth_{i,t} + \alpha_2\ Size_{i,t} + \alpha_3\ EP_{i,t} \\ & + \alpha_4\ Leverage_{i,t} + \alpha_5\ MKT_{i,t} + \alpha_6\ RD_{i,t} + \alpha_7\ CAP_{i,t} + \alpha_8\ BTM_{i,t} \\ & + \alpha_9\ Div\ yield_{i,t} + \alpha_{10}\ Past\ RET_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

[7] To calculate peer performance, I construct peer portfolios matched on industry and firm size. First, I form annual portfolios based on two-digit standard industry classification (SIC) codes. I use all the firms on Compustat to construct portfolios. Second, I sort firms by beginning-of-year market value into size quartiles. Third, I match each firm with an industry-size peer group. Peer performance is the equal-weighted portfolio EPS for an industry-size peer group. When calculating portfolio EPS, I exclude the EPS of the observed firm.

[8] For example, when oil prices rise, both boards and analysts may revise their expectations of future performance downward, resulting in a positive correlation between target revisions and analyst forecasts. By controlling for stock returns, which contain information besides earnings (Ball and Brown 1968; Basu 1997), I expect $Analyst\ forecast\ dev_{i,t+1}$ to reflect analysts' unique information sets beyond public information.

The dependent variable is *EPS growth*$_{i,t+1}$, which is defined as the EPS growth between year t and t+1. Following prior research on the factors that affect the growth of accounting earnings and sales (Chan, Karceski, and Lakonishok 2003; Ciftci and Cready 2011; Gong and Li 2013; Nissim and Penman 2003), I control for growth in EPS over the previous three years (*Past EPS growth*), the natural logarithm of the market value of equity (*Size*), the earnings-to-price ratio (*EP*), leverage (*Leverage*), advertising expenses divided by sales (*MKT*), the average of R&D expenses divided by sales over the previous three years (*RD*), the average of capital expenditures divided by total assets over the previous three years (*CAP*), the book-to-market ratio (*BTM*), the dividend yield ratio (*Div yield*), and stock returns over the past 12 months (*Past RET*). I estimate Equation (2) separately for each fiscal year and two-digit SIC code group. Appendix C provides more detailed variable definitions.

4. DESCRIPTIVE STATISTICS

Table 2 provides the descriptive statistics for my key variables including *Target revision*$_{i,t+1}$, *Target deviation*$_{i,t}$, *Analyst forecast dev*$_{i,t+1}$, and several firm characteristics. For ease of interpretation, I also present the descriptive statistics of the unscaled variables: (*Target EPS*$_{i,t+1}$ – *Target EPS*$_{i,t}$), (*Actual EPS*$_{i,t}$ – *Target EPS*$_{i,t}$), and (*Analyst forecast*$_{i,t+1}$ − *Actual EPS*$_{i,t}$). The mean (median) values of ($Target\ EPS_{i,t+1}$ – $Target\ EPS_{i,t}$) and $Target\ revision_{i,t+1}$ are \$0.189 (\$0.190) and 11.9% (9.0%), respectively, suggesting that EPS targets are typically revised upward by 18.9 cents (11.9% of prior target EPS). The mean of ($Actual\ EPS_{i,t}$ – $Target\ EPS_{i,t}$) is \$0.000, while the actual EPS is on average 0.4% higher than the target (i.e., $Target\ deviation_{i,t}$), indicating that actual performance in year *t* is, on average, slightly higher than the target. The mean values of ($Analyst\ forecast_{i,t+1}$ − $Actual\ EPS_{i,t}$) and $Analyst\ forecast\ dev_{i,t+1}$ are \$0.175 and 11.3%, respectively. The mean (median) values of (*Management* $\text{forecast}_{i,t+1}$ – $Actual\ EPS_{i,t}$) and $Management\ forecast\ dev_{i,t+1}$ are \$0.094 (\$0.110) and 11.9% (4.9%), respectively. The means of the market value of equity and book value of total assets are \$13,069 million and \$19,215 million, respectively. The mean (median) of $Relative\text{-}to\text{-}peers_{i,t}$ is 0.864 (0.700), and the mean and median values of $Growth_{i,t+1}$ are 17.8% and 14.4%, respectively.

(Table 2 here)

Table 3 provides the correlation matrix of my key variables. Note that $Target\ EPS_{i,t+1}$ − $Target\ EPS_{i,t}$ is positively associated with $Actual\ EPS_{i,t}$ − $Target\ EPS_{i,t}$. That is, targets tend to be revised in the same direction as past performance variances. $Target\ EPS_{i,t+1}$ − $Target\ EPS_{i,t}$ is also positively correlated with $Analyst\ forecast_{i,t+1}$ − $Actual\ EPS_{i,t}$, providing univariate evidence in support of my first hypothesis that boards incorporate analyst forecast information in setting bonus targets for executives. The positive correlation between *Target* $EPS_{i,t+1}$ − *Target* $EPS_{i,t}$ and $Growth_{i,t+1}$ highlights the importance of controlling for firm-specific growth in the empirical models that attempt to explain firms' target revisions (Indjejikian et al. 2014b).

(Table 3 here)

5. EMPIRICAL RESULTS

Do Boards Incorporate Analyst Forecasts in the Target Setting of Their Executive Annual Bonus Contracts (H1)?

Panel A of Table 4 reports the results of estimating Equation (1). Column (1) shows the baseline results without analyst forecast information. Consistent with prior studies, the coefficient on *Target* $deviation_{i,t}$ is significantly positive, suggesting that boards consider past performance variances (i.e., target ratcheting) in revising targets.

The coefficient on *Target* $deviation_{i,t}*D\_NEG_{i,t}$ is significantly negative, consistent with findings of prior studies that targets tend to ratchet asymmetrically (Leone and Rock 2002; Bouwens and Kroos 2011; Aranda et al. 2014; Kim and Shin 2016). A significantly negative coefficient on $Relative\text{-}to\text{-}peers_{i,t}$ suggests that boards consider peer performance as a proxy for average levels of productivity and that outperforming firms (i.e., those with higher values of $Relative\text{-}to\text{-}peers_{i,t}$) experience downward target revisions in the subsequent period (Aranda et al. 2014; Indjejikian et al. 2014a; Kim and Shin 2016).

To minimize the effect of outliers on my results, I re-estimate the model using the median regressions in Column (2). My results remain very similar to those in Column (1).[9]

(Table 4 here)

Column (3) of Table 4 provides the estimation results to test H1. The coefficient on *Analyst forecast* $dev_{i,t+1}$ is positive and significant. This indicates that boards use analyst forecasts as an external information source in setting future bonus targets, going above and beyond information on past and relative performance. Furthermore, the adjusted R^2s increase significantly, from 66% in Column (1) to 73% in Column (3), as a result of including the analyst forecast variable. This further highlights the importance of analyst forecasts as an additional information source in target setting.

The results in Column (3) remain unchanged when I use the median regression model, as presented in Column (4). To summarize, the results in Table 4 illustrate how vital analyst forecasts are when boards set future targets.

[9] Many prior studies use median regression, a form of the least absolute deviations (LAD) estimation, because it is believed to be less susceptible to outliers (Ortiz-Molina 2007; Chen, Liu, and Ryan 2008; Indjejikian et al. 2014a).

I also note that the coefficients on expected growth and peer performance, which are highly significant in Columns (1) and (2), become insignificant once analyst forecast information is included in Columns (3) and (4). This suggests that analysts incorporate a firm's expected growth and peer performance information in their earnings forecasts.

I note that prior studies on target setting have relied on survey data (Holthausen et al. 1995; Indjejikian and Nanda 2002; Indjejikian et al. 2014a) or on division-level data of a single firm (Leone and Rock 2002; Bol et al. 2010; Anderson et al. 2010; Bouwens and Kroos 2011), which limits the generalizability of the findings. However, the samples in these prior studies had the advantage of being more homogenous than my sample. Thus, my results could be more sensitive to outliers. To mitigate this concern, I re-estimate Equation (1) after treating outliers by using methods as described below. Panel B of Table 4 shows the results.

In Column (1), I winsorize all variables at the top and bottom 5% levels and then re-estimate Equation (1). In Column (2), I estimate Equation (1) after truncating all variables at the top and bottom 1% levels. In addition, in Column (3), I restrict my sample to observations that have absolute studentized residual values of less than two (Belsley, Kuh, and Welsch 1980). I also delete any observations that have a Cook's D value (Cook 1977) of greater than four divided by the number of observations in Column (4). Finally, I estimate Equation (1) using the subsample of S&P 500 LargeCap, S&P 400 MidCap, and S&P 600 SmallCap. The results are in Columns (5), (6), and (7), respectively. As reported in the table, the coefficients on $Analyst\ forecast\ dev_{i,t+1}$ are significantly positive in all columns. Overall, I conclude that the results in Panel A of Table 4 are robust to the effect of outliers.

The Effects of Noise in Analyst Forecasts and Analysts' Information Advantage Over Management on the Use of Analyst Forecasts in Target Setting (H2 and H3)

I estimate the following model to test H2 and H3:

$$\begin{aligned} Target\ revision_{i,t+1} = {} & \lambda_0 + \lambda_1\ Target\ deviation_{i,t} + \lambda_2\ Target\ deviation_{i,t} * D\_NEG_{i,t} \\ & + \lambda_3\ Analyst\ forecast\ dev_{i,t+1} \\ & + \lambda_4\ Analyst\ forecast\ dev_{i,t+1} * Avg\ forecast\ error\ quartile_{i,t} \\ & + \lambda_5\ Analyst\ forecast\ dev_{i,t+1} * Forecast\ dispersion\ quartile_{i,t+1} \\ & + \lambda_6\ Analyst\ forecast\ dev_{i,t+1} * Avg\ cyclicality_{i,t} \\ & + \lambda_7\ Avg\ forecast\ error\ quartile_{i,t} \\ & + \lambda_8\ Forecast\ dispersion\ quartile_{i,t+1} + \lambda_9\ Avg\ cyclicality_{i,t} \\ & + \lambda_{10}\ D\_NEG_{i,t} + \lambda_{11}\ Relative\text{-}to\text{-}peers_{i,t} + \lambda_{12}\ Growth_{i,t+1} \\ & + \lambda_{13}\ Ret_{i,t} + Year\ and\ industry\ fixed\ effects + \varepsilon_{i,t} \qquad (3) \end{aligned}$$

I include two variables in the model to reflect the degree of noise in analyst forecasts: 1) analyst forecast errors and 2) analyst forecast dispersion. $Avg\ forecast\ error\ quartile_{i,t}$ is defined as the quartile rank of average analyst forecast errors over the past three years. Analyst forecast errors for year *t* are calculated as the absolute value of actual EPS minus the average of the most recent analyst forecasts of year *t* earnings issued from the announcement of year

t-1 earnings to the announcement of year t earnings, scaled by $Target\ EPS_{i,t}$. $Forecast\ dispersion\ quartile_{i,t+1}$ is the quartile rank of analyst forecast dispersion, where forecast dispersion is measured as the standard deviation of analyst forecasts of year t+1 earnings, scaled by $Target\ EPS_{i,t}$. I use the forecasts of year t+1 earnings issued over the period from the announcement of year t earnings to the approval date of the annual bonus plan for year t+1. If the approval date is missing, I instead use the end of the three-month period after fiscal year-end to proxy for it.

To capture the information advantage analysts have over management, I follow Hutton et al. (2012) and construct $Avg\ cyclicality_{i,t}$, which reflects analysts' expertise at assessing the impact of macroeconomic factors on firm performance. $Avg\ cyclicality_{i,t}$ is defined as the average of $Cyclicality_{i,t}$ over the prior three years, and $Cyclicality_{i,t}$ is the R^2 from the following firm-specific regression over the prior five years:

$$IB_{i,t} = \beta_0 + \beta_1 GDP_t + \varepsilon_{i,t} \tag{4}$$

where $IB_{i,t}$ is income before extraordinary items, GDP_t is nominal annual GDP, and $Cyclicality_{i,t}$ captures the ability of GDP to explain firm-level earnings. If a firm's earnings are highly correlated with the overall economy, $Avg\ cyclicality_{i,t}$

will have a higher value.[10]

Table 5 shows my results of estimating Equation (3).[11] In Column (1), the coefficients on *Analyst forecast* $dev_{i,t+1}$**Avg forecast error* $quartile_{i,t}$ (-0.092; *t*-value: -1.72) and *Analyst forecast* $dev_{i,t+1}$**Forecast dispersion* $quartile_{i,t+1}$ (-0.086; *t*-value: -1.86) are all significantly negative. This suggests that boards are less likely to rely on analyst forecasts in revising targets when forecast errors or dispersion are high. The results are consistent with the notion that boards adjust the relative weights on analyst forecasts depending on the level of perceived noise in the information sources.

Regarding the effect of the informational advantage of analysts on the use of analyst forecasts in target setting, I find that the coefficient on *Analyst forecast* $dev_{i,t+1}$**Avg* $cyclicality_{i,t}$ (0.350; *t*-value: 2.31) is significantly positive. The results indicate that when a firm's earnings are highly correlated with GDP, boards will rely more on forecasts in setting annual bonus targets in order to exploit analysts' information advantage. I also report the estimation results from the median regression in Column (2). The results are not affected by the alternative estimation specification.

---

[10] *Cyclicality* will be high when the relation between firm performance and GDP is significantly positive (i.e., cyclical) or significantly negative (i.e., countercyclical).
[11] Note that the sample size is reduced from 1,051 to 1,026, because I require non-missing values for additional variables such as forecast error, forecast dispersion, and cyclicality.

Overall, the results in Table 5 support my predictions that the use of analyst forecasts in target setting is less pronounced when analyst forecasts are noisier and that it is more pronounced when analysts have informational advantages over management.

(Table 5 here)

The Use of External Benchmark information on the Magnitude of Target Ratcheting (H4)

I estimate the following model to test H4:

$$
\begin{aligned}
\textit{Target revision}_{i,t+1} = {} & \lambda_0 + \lambda_1 \textit{ Target deviation}_{i,t} + \lambda_2 \textit{ Target deviation}_{i,t} * D\_NEG_{i,t} \\
& + \lambda_3 \textit{ Target deviation}_{i,t} * \textit{Relative-to-forecasts}_{i,t} \\
& + \lambda_4 \textit{ Target deviation}_{i,t} * D\_NEG_{i,t} * \textit{Relative-to-forecasts}_{i,t} \\
& + \lambda_5 \textit{ Target deviation}_{i,t} * \textit{Relative-to-peers}_{i,t} \\
& + \lambda_6 \textit{ Target deviation}_{i,t} * D\_NEG_{i,t} * \textit{Relative-to-peers}_{i,t} \\
& + \lambda_7 \, D\_NEG_{i,t} * \textit{Relative-to-forecasts}_{i,t} \\
& + \lambda_8 \, D\_NEG_{i,t} * \textit{Relative-to- peers}_{i,t} + \lambda_9 \textit{ Relative-to-forecasts}_{i,t} \\
& + \lambda_{10} \textit{ Relative-to-peers}_{i,t} + \lambda_{11} \, D\_NEG_{i,t} + \lambda_{12} \textit{ Growth}_{i,t+1} \\
& + \lambda_{13} \textit{ Ret}_{i,t} + \textit{Year and industry fixed effects} + \varepsilon_{i,t} \qquad (5)
\end{aligned}
$$

I include the interaction terms of target ratcheting and *Relative-to-forecasts*$_{i,t}$ and asymmetric target ratcheting and *Relative-to-forecasts*$_{i,t}$. *Relative-to-forecasts*$_{i,t}$ is defined as the difference between *Actual EPS*$_{i,t}$ *Analyst forecasti,t*. *Analyst forecast*$_{i,t}$ is average analyst forecasts for year t earnings issued before the announcement of year t earnings. If an analyst issues multiple forecasts during this period, I use only the most recent one. I additionally control the interaction terms of *Target deviation*$_{i,t}$ **Relative-to-peers*$_{i,t}$ and *Target deviation*$_{i,t}$ **D_NEG*$_{i,t}$ **Relative-to-peers*$_{i,t}$ to control the effect of peer information in target setting process (Aranda et al. 2014; Indjejikian et al. 2014b; Bol and Lill 2015).

Table 6 shows the results for estimating equation (5). The coefficients for *Target deviation*$_{i,t}$ **Relative-to-peers*$_{i,t}$ is significantly negative and The coefficients for *Target deviation*$_{i,t}$ **D_NEG*$_{i,t}$ **Relative-to-peers*$_{i,t}$ is significantly positive, suggesting the findings of ratchet attenuation when firm performance is greater than peer performance (Aranda et al. 2014; Bol and Lill 2015). I also find the coefficients on *Target deviation*$_{i,t}$ **Relative-to-forecasts*$_{i,t}$ are significantly negative and the coefficients on *Target deviation*$_{i,t}$ **D_NEG*$_{i,t}$ **Relative-to-forecasts*$_{i,t}$ are significantly positive. These results suggest that target ratcheting becomes weaker for favorable performance variance and becomes stronger for unfavorable performance variance when firm performance is higher than analyst forecasts, supporting my hypothesis 4.

(Table 6 here)

6. ADDITIONAL ANALYSES

Comparing the Relative Importance of Analyst Forecasts versus Management Forecasts in Target Setting

One can argue that internal future planning information (e.g., internal budgeting) is more important than analyst forecasts in target setting because it reflects managers' private information. Because managers possess superior knowledge of a firm's economic environment, such information should be quite valuable to boards in target setting. However, one downside to using internal information like this is that it is subject to managers' opportunistic behaviors.

For example, prior studies find that using budgets in performance evaluation can cause managers to understate their expected productivity (Young 1985; Chow, Cooper, and Waller 1988). In fact, independent compensation committees would be less willing to use information provided by managers themselves in setting targets unless it is verifiable and objective. Furthermore, Cassar and Gibson (2008) report that budget preparation does not improve managers' forecast accuracy because budgets are not only a forecasting tool but are also used for other purposes, such as to communicate objectives and motivate employees. Overall, whether internal future planning information should be more important than analyst forecasts in target setting remains an empirical question.

To examine the relative importance of analyst earnings forecasts versus internal planning information in target setting, I use managers' earnings forecasts as a proxy for internal planning information and include them in my regressions. [12] Specifically, I re-estimate Equation (1) after controlling for management earnings forecasts, as follows:

---

[12] Prior studies have established a theoretical link between external management earnings

$$
\begin{aligned}
\textit{Target revision}_{i,t+1} = \lambda_0 + \lambda_1 \textit{ Target deviation}_{i,t} \\
+ \lambda_2 \textit{ Target deviation}_{i,t} * D\_NEG_{i,t} + \lambda_3 \textit{ Analyst forecast dev}_{i,t+1} \\
+ \lambda_4 \textit{ Management forecast dev}_{i,t+1} + \lambda_5 \; D\_NEG_{i,t} \\
+ \lambda_6 \textit{ Relative-to-peers}_{i,t} + \lambda_7 \textit{ Growth}_{i,t+1} + \lambda_8 \textit{ Ret}_{i,t} \\
+ \textit{Year and industry fixed effects} + \varepsilon_{i,t} \qquad (6)
\end{aligned}
$$

Management forecast dev$_{i,t+1}$ is the difference between *Management forecast*$_{i,t+1}$ and *Actual EPS*$_{i,t}$, divided by *Target EPS*$_{i,t}$, *Management forecast*$_{i,t+1}$ is the most recent management forecasts of year t+1 earnings issued over the period from the announcement of year t earnings to the approval date of the annual bonus plan for year t+1. If boards rely on information in analyst earnings forecasts in target setting above and beyond that in management earnings forecasts, the coefficient on *Analyst forecast dev*$_{i,t+1}$ (λ_3) will be positive and significant after controlling for *Management forecasts dev* $_{i,t+1}$.

Panel A of Table 7 presents my results. In Columns (1) and (2), the sample size is reduced to 598 observations because of the management earnings forecast requirement. As a starting point, Column (1) shows the results of estimating the model that replaces *Analyst forecast dev*$_{i,t+1}$ with *Management forecast dev*$_{i,t+1}$. The coefficient on *Management forecast dev*$_{i,t+1}$ is significantly positive, suggesting that these forecasts are likely important to boards in setting annual bonus targets. However, in Column (2), where both variables are

---

forecasts and internal management planning information (Hemmer and Labro 2008). They use management earnings forecasts as a proxy for internal planning and budget information (Goodman, Neamtiu, Shroff, and White 2014).

included in the model, the coefficient on *Analyst forecast* $dev_{i,t+1}$ is significantly positive, while the coefficient on *Management forecast* $dev_{i,t+1}$ loses its significance.[13] This result suggests that analyst forecasts are incrementally informative in explaining target revisions.

The weak results for management forecasts may reflect the fact that managers can strategically use forecasts for their own interests, such as maximizing trading profits (Cheng and Lo 2006) or influencing market expectations. Overall, the results in Columns (1) and (2) of Panel A in Table 7 suggest that boards rely on the information in analyst earnings forecasts more heavily than that in management earnings forecasts.

One potential issue related to estimating Equation (6) is that analyst forecasts can be affected by management forecasts (Jennings 1987; Hassell, Jennings, and Lasser 1988).[14] For example, the expectation management literature suggests that management earnings forecasts are often strategically used to "walk down" analyst earnings expectations (Matsumoto 2002; Cotter, Tuna, and Wysocki. 2006; Feng and McVay 2010).

---

[13] The variance inflation factors for *Analyst forecast* $dev_{i,t+1}$ and *Management forecast* $dev_{i,t+1}$ are 2.36 and 3.51, respectively. Therefore, any multicollinearity in the model is not severe.

[14] For example, Jennings (1987) finds a positive relation between stock price reactions and analyst forecast revisions in accordance with management forecasts. Hassell et al. (1988) document that the direction and consequence of news from management forecasts are positively associated with those of analyst forecast revisions.

To minimize the influence of those findings on my results, I identify a subsample in which the impact of management forecasts on analyst forecasts is likely to be attenuated. I then test the relevance of analyst forecasts in target setting using this subsample. Specifically, I estimate Equation (1) using a subsample of firms that do not issue management earnings forecasts. As a result, I can consider these forecasts to be free of their influence.

The results are presented in Column (3) of Panel A. The coefficient on *Analyst forecast* $dev_{i,t+1}$ remains positive and significant, suggesting that analyst forecast information itself is important to bonus target setting.[15] Alternatively, I measure analyst forecasts from the period *before* management forecasts are issued for the subsample with them, in order to ensure that analyst forecasts in this subsample are not influenced by management forecasts. Specifically, *Analyst* $forecast_{i,t+1}$ is defined as the most recent forecasts of year t+1 earnings issued over the period from the announcement of year t earnings to the date of management forecast issuance. The estimation results are reported in Column (4) of Panel A. The coefficient on *Analyst forecast* $dev_{i,t+1}$ is also still significantly positive, and the coefficient on *Management forecast* $dev_{i,t+1}$ is insignificant.

[15] Grabner, Moers, and Vorst (2016) find that the quality of the target-setting process is positively associated with the probability of issuing management guidance. However, they also suggest that a high-quality process does not guarantee the accuracy of management forecasts because managers use their informational advantage strategically to increase the likelihood of meeting or beating guidance. If boards recognize this phenomenon, they will prefer analyst forecasts over management forecasts when setting bonus targets.

Finally, I directly examine whether potentially "walked-down" analyst forecasts provide any incremental information to boards above that of management forecasts, by measuring them from the period *after* management forecasts are issued. *Analyst forecast*$_{i,t+1}$ in Column (5) is measured by using the most recent forecasts of year t+1 earnings issued over the period from the date of management forecast issuance to the approval date of the annual bonus plan for year t+1. Because analyst forecasts for this subsample are issued *after* management forecasts, I expect them to be influenced by managers' expectations. Therefore, if "walked-down" analyst earnings forecasts provide no further incremental information, the coefficient on *Analyst forecast dev*$_{i,t+1}$ should be insignificant.

However, note that the results in Column (5) are very similar to those in Column (4). This suggests that, even if analyst forecasts are walked down, boards appear to rely more on analyst forecasts and are less willing to use managers' own projections in setting targets. I posit that this is because management forecasts can be used strategically by managers (Young 1985; Chow et al. 1988; Cheng and Lo 2006; Matsumoto 2002; Cotter et al. 2006; Feng and McVay 2010).

Overall, the findings in Panel A of Table 7 lend support to the notion that analyst forecasts can provide incremental information above and beyond management forecasts in explaining target revisions by the board.

Potential Reverse Causality: Analyst Forecast Revisions Around the Approval Date of the Annual Bonus Plan

Reverse causality is another potential concern with my results. For example, one may argue that the positive association between analyst forecasts and firms' bonus target revisions is consistent with the possibility that analysts update their forecasts based on boards' internal targets. I believe that using analyst forecasts issued *before* the approval date of the plan in my main analyses mitigates this concern. However, I nevertheless explore this possibility by examining the individual analyst forecast revisions surrounding the bonus plan approval dates. Specifically, I examine whether individual analysts revise their forecasts upward (downward) after the approval date in response to the news contained in the target revisions if bonus targets are set higher (lower) than their own previous forecasts.

The test results are in Panel B of Table 7. The sample consists of 585 observations with available data at the firm-year-analyst level. I define *Low bonus target*$_{i,j,t+1}$ (*High bonus target*$_{i,j,t+1}$) as 1 if the bonus target of year t+1 is lower (higher) than *Analyst forecast*$_{i,j,t+1}$, and 0 otherwise, where *Analyst forecast*$_{i,j,t+1}$ represents the most recent individual analyst forecasts for year t+1 earnings issued before the approval date. *Walked-down analyst forecast*$_{i,j,t+1}$ (*Walked-up analyst forecast*$_{i,j,t+1}$) equals 1 if the earliest analyst forecast for year t+1 earnings issued within seven days of the bonus plan approval date for year t+1 is lower (higher) than *Analyst forecast*$_{i,j,t+1}$, and 0 otherwise. If individual analysts revise their forecasts around the approval date of the bonus plan (as the reverse causality argument implies), I should observe a positive correlation between *Low bonus target*$_{i,j,t+1}$ and *Walked-down analyst forecast*$_{i,j,t+1}$ (*High bonus target*$_{i,j,t+1}$ and *Walked-up analyst forecast*$_{i,j,t+1}$). The results in Panel B show that the signs of the correlations are positive but insignificant. This suggests that reverse causality is unlikely to have any explanatory power in this context for my main findings.[16]

(Table 7 here)

Time-series Analysis

Leone and Rock (2002) suggest that "the setting of budgets is an inherently inter-temporal process." Therefore, the estimates of a target-setting

[16] In addition, my findings for H3 provide additional (indirect) evidence that rejects the reverse causality argument. When firm performance is strongly correlated with macroeconomic factors (i.e., when cyclicality is high), analyst forecasts tend to be highly accurate and informative (Hutton et al. 2012). As a result, it will be more difficult for management to "walk" forecasts down or up, and analyst forecasts will be less likely to be affected by targets. Reverse causality implies that the correlation between target revisions and analyst forecasts is weaker, not stronger, when cyclicality is high, because that is when analyst forecasts are less likely to be affected by annual bonus targets or management forecasts. However, the results presented in Table 5 show that the association is actually stronger when cyclicality is high, which negates any reverse causality explanation here.

regression model within a single firm are similar over time but systematically different across firms. To address this concern, I restrict my sample to observations with no missing values of *Target revision*$_{i,t+1}$, *Target deviation*$_{i,t}$, or *Analyst forecast dev*$_{i,t+1}$ for the entire sample period (2008-2014). This restriction reduces my sample size from 1,051 to 396 (66 firms). I estimate Equation (7) separately for these 66 firms.[17]

$$Target\ revision_{i,t+1} = \lambda_0 + \lambda_1\ Target\ deviation_{i,t} + \lambda_2\ Analyst\ forecast\ dev_{i,t+1} + \varepsilon_{i,t} \qquad (7)$$

Table 8 presents firm-specific regression results, which show that the mean of coefficients on *Analyst forecast dev*$_{i,t+1}$ is positive and significant (0.687, Z-stat: 40.14). This again confirms the results in Table 4, lending further support to H1.

(Table 8 here)

Alternative Growth Proxies

I construct alternative growth measures by using sales growth, income before extraordinary items growth, and operating income before depreciation growth as dependent variables in Equation (2). All of the results are consistent with those previously reported.

[17] The degree of freedom should be larger than 3 to estimate *Z*-stat. Therefore, I only control intercept, *Target deviation*$_{i,t}$, and *Analyst forecast dev*$_{i,t+1}$ in equation (7).

7. CONCLUSION

This study examines whether boards use external information (e.g., analyst forecasts) above and beyond past performance and peer performance to set targets for executive annual bonus contracts. Prior literature has largely focused on whether compensation targets tend to "ratchet," and, if so, whether they do so asymmetrically. A growing body of research has begun to examine various alternative sources of information. However, the use of analyst forecasts in target setting has received little attention thus far despite its importance in the capital markets. I summarize my main findings as follows.

First, I find that analysts' annual earnings forecasts are positively associated with future bonus target revisions. This result is robust to various specifications to control for the effect of influential outliers. Second, I find that a firm's reliance on analyst forecasts in target revisions is less pronounced if analyst forecasts are noisy. Specifically, if prior analyst forecast errors for a firm are higher or if analyst forecasts are more dispersed, boards rely on them less heavily when setting future targets.

Third, the informational advantage that analysts have over managers affects the extent to which their forecasts are used in target revisions. Specifically, boards place more weight on analyst forecast information for firms with operations that are more highly correlated with the overall economy. Fourth, I find that the degree of target ratcheting decreases (increases) for favorable (unfavorable) variance when past performance exceeds analyst forecasts.

Finally, the results from additional analyses are not consistent with alternative explanations that both bonus target revisions and analyst forecasts are influenced by internal planning information or that analyst forecasts are influenced by bonus target revisions (e.g., reverse causality). Overall, my paper contributes to the literature by documenting that analyst forecasts are an increasingly vital source of information for boards in target setting.

2014 Performance-Based Plans

Our executive compensation programs place a heavy emphasis on performance-based rewards. We maintain a short-term incentive plan, known as our annual bonus plan, as well as a long-term incentive plan. Awards to our NEOs under our annual bonus plan are made under our 2008 Performance-Based Management Incentive Plan, and awards under our long-term incentive plan are granted under our 2008 Omnibus Equity Plan. Awards under our annual bonus plan are directly tied to the achievement of our annual operating goals, which are aligned with the Company's short- and long-term strategic plans. Our long-term incentives are directly tied to the performance of the price of shares of our common stock, which align our executives' long-term interests with the interests of our stockholders.

In setting our annual goals, in addition to our internal forecasts, we consider analysts' projections for our performance and the performance of companies in our peer group, as well as broad economic and industry trends. We establish challenging targets that result in payouts at target levels only when Company performance warrants it. The Compensation Committee is responsible for reviewing and approving our annual Company goals, targets and levels of payout (e.g., threshold, target, and maximum) and for reviewing and determining actual performance results at the end of the performance period.

Appendix B 2014 Proxy Statement of El Paso Electronic Company

2014 ANNUAL CASH BONUS PLAN

Metric	Weighting (%)	Performance Goals: Threshold	Target	Maximum	Performance Result: Actual Result	Final Payout (as % of Target Bonus): CEO	Other NEOs (averaged)
EPS	50	$2.20	$2.30	$2.45	$2.27	39.7	38.2
Customer Satisfaction							
3rd Party Customer Survey	10	75	78	81	81	20	17.9
Call Center Performance (%)	10	70%	80%	90%	86%	16	14.7
Reliability (SAIDI) (min)	15	45.6 min	41.9 min	39.9 min	46.6 min	0	0
Safety							
DART (measure of injuries)	3.75	1.5	1.2	0.9	1.73	0	0
Vehicle accident	3.75	3.6	2.6	1.6	1.55	7.5	6.7
Leading Indicator activities	2.5	4 points	6 points	8 points	Maximum	5	3.7
Compliance	5	N/A	Fully Compliant	N/A	Target	5	5
Total	100					93.2	86.2

Bonuses are paid in late February or early March after the Compensation Committee reviews the audited financial results and operational performance for the previous year. As reported in the Annual Report on Form 10-K for the year ended December 31, 2014, and as shown in the above table, the Company had net income of $2.27 per basic share, which includes an accrual for the cost of the bonus pool. The Company also met (or failed to meet) its customer satisfaction goals, its reliability goal, its three safety goals and its compliance goal, in each instance at the level reflected in the above table. As a result, each NEO received a bonus, as set forth in the table below and also in the Summary Compensation Table later in this proxy statement. The total bonus paid to Company employees for 2014 was approximately $7.4 million, of which approximately $1.9 million was paid to the NEOs and other executive officers.

Appendix C Variable Definitions

Variable	Definition
	Primary Variables of Interest
Target EPS$_{i,t}$	= Firm *i*'s target EPS used in a firm's executive bonus plan for fiscal year *t*.
Actual EPS$_{i,t}$	= Firm *i*'s actual EPS for fiscal year *t*.
Target revision$_{i,t+1}$	= (*Target EPS*$_{i,t+1}$ − *Target EPS*$_{i,t}$) divided by *Target EPS*$_{i,t}$.
Target deviation$_{i,t}$	= (*Actual EPS*$_{i,t}$ − *Target EPS*$_{i,t}$) divided by *Target EPS*$_{i,t}$.
Analyst forecast dev$_{i,t+1}$	= The difference between *Analyst forecast*$_{i,t+1}$ and *Actual EPS*$_{i,t}$ divided by *Target EPS*$_{i,t}$. *Analyst forecast*$_{i,t+1}$ is average analyst forecasts for year *t*+1 earnings issued over the period from the announcement of year *t* earnings to the approval date of the annual bonus plan for year *t*+1. If the approval date is missing, I use the end date of the three months after fiscal year-end. And if an analyst issues multiple forecasts during this period, I use only the most recent one.
Management forecast dev$_{i,t+1}$	= The difference between *Management forecast*$_{i,t+1}$ and *Actual EPS*$_{i,t}$ divided by *Target EPS*$_{i,t}$. *Market value*$_{i,t}$ is computed as the closing market price per share of firm *i* multiplied by the number of shares outstanding at fiscal year-end. *Management forecast*$_{i,t+1}$ is the most recent management forecast of year *t*+1 earnings issued over the period from the announcement of year *t* earnings to the approval date of the annual bonus plan for year *t*+1.
D_NEG$_{i,t}$	= Equals 1 if *Target deviation*$_{i,t}$ is negative, and 0 otherwise.
Avg forecast error Quartile$_{i,t}$	= The quartile rank of average analyst forecast errors over the past three years. Analyst forecast errors are calculated as the absolute value of actual EPS minus the average of the most recent analyst forecasts of year *t* earnings issued from the announcement of year *t*-1 earnings to the announcement of year *t* earnings, scaled by *Target EPS*$_{i,t}$.
Forecast dispersion Quartile$_{i,t+1}$	= The quartile rank of analyst forecast dispersion, where dispersion is measured as the standard deviation of analyst forecasts of year *t*+1 earnings, scaled by *Target EPS*$_{i,t}$.
Avg Cyclicality$_{i,t}$	= The average of cyclicality over the prior three years. Cyclicality is defined as the R^2 from the following firm-specific regression over the prior five years (Hutton et al. 2012):

		$$IB_{i,t} = \beta_0 + \beta_1 GDP_t + \varepsilon_{i,t} \quad (4)$$ where *IB* is income before extraordinary items, and *GDP* is the nominal annual gross domestic product.
Low (High) bonus target$_{i,j,t+1}$	=	Equals 1 if annual bonus target of year t+1 is lower (higher) than *Analyst forecast*$_{i,j,t+1}$, and 0 otherwise. *Analyst forecast*$_{i,j,t+1}$ is the most recent individual analyst forecasts for year t+1 earnings issued before the approval date.
Walked-down (up) analyst forecasts$_{i,j,t+1}$	=	Equals 1 if the earliest analyst forecast for year t+1 earnings issued within seven days of the approval date of the annual bonus plan for year t+1 is lower (higher) than *Analyst forecast*$_{i,j,t+1}$, and 0 otherwise. *Analyst forecast*$_{i,j,t+1}$ is the most recent individual analyst forecasts for year t+1 earnings issued before the approval date.

Variable		Description
		Control Variables
Growth$_{i,t+1}$	=	The expected EPS growth estimated from the following model: $$EPS\ growth_{i,,t+1} = \alpha_0 + \alpha_1\ Past\ EPS\ growth_{i,t} + \alpha_2\ Size_{i,t} + \alpha_3\ EP_{i,t} + \alpha_4\ Leverage_{i,t} + \alpha_5\ MKT_{i,t} + \alpha_6\ RD_{i,t} + \alpha_7\ CAP_{i,t} + \alpha_8\ BTM_{i,t} + \alpha_9\ Div\ yield_{i,t} + \alpha_{10}\ Past\ RET_{i,t} + Year\ dummy + \varepsilon_{i,t} \quad (2)$$ *Growth*$_{i,t+1}$ is the firm-level expected value of the above cross-sectional model. Following previous research on factors affecting the growth of accounting earnings and sales (Chan, Karceski, and Lakonishok 2003; Ciftci, and Cready 2011; Gong and Li 2013; Nissim and Penman 2003), I control for the growth in EPS over the previous three years (*Past EPS growth*), firm size (*Size*), the earnings to price ratio (*EP*), leverage (*Leverage*), advertising expenses divided by sales (*MKT*), the average of R&D expenses divided by sales over the previous three years (*RD*), the average of capital expenditures divided by total assets over the previous three years (*CAP*), the book-to-market ratio (*BTM*), the dividend yield ratio (*Div yield*), and stock returns over the prior 12 months (*Past RET*). I compute leverage (*Leverage*) as liabilities less cash holdings over total assets less cash holdings. The book-to-market ratio (*BTM*) is calculated as total assets divided by the market value of equity plus long-term liabilities. The dividend yield ratio (*Div yield*) is ordinary cash dividends divided by net income before extraordinary items. I estimate the expected growth separately for each fiscal year and two-digit SIC code group. For a robustness check, I replace the dependent variable of the above regression with alternative operating performance

		measures, such as sales, income before extraordinary items, and operating income before depreciation.
Relative-to-peers$_{i,t}$	=	Firm *i*'s EPS for fiscal year *t* less peer firms' EPS for fiscal year *t* (Kim and Shin 2017). Peer portfolios are constructed following Albuquerque (2009) as follows. To construct peer portfolios matched on industry and firm size, I first form annual portfolios based on two-digit SIC codes. I use all firms on Compustat to construct portfolios. Second, I sort firms by beginning-of-year market value into size quartiles. Third, I match each firm with an industry-size peer group. Peer performance is the equal-weighted portfolio EPS for an industry-size peer group. When calculating portfolio EPS, I exclude the EPS of the observed firm.
Relative-to-forecasts$_{i,t}$	=	The difference between *Actual EPS*$_{i,t}$ and *Analyst forecast*$_{i,t}$. *Analyst forecast*$_{i,t}$ is average analyst forecasts for year *t* earnings issued before the announcement of year *t* earnings. If an analyst issues multiple forecasts during this period, I use only the most recent one.
Ret$_{i,t}$	=	The firm's stock returns over the 12-month period ending three months after fiscal year-end *t*.

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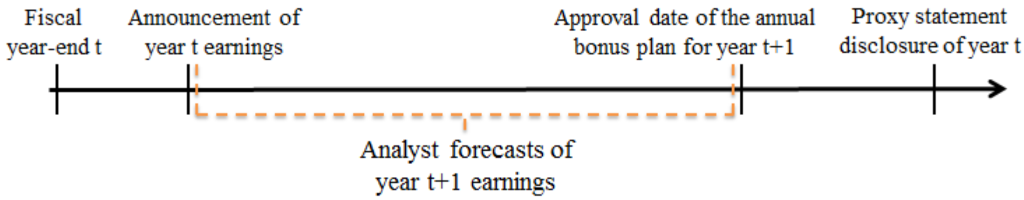
FIGURE 1
Timeline of Analyst Forecasts



This figure illustrates the timeline of analyst forecasts for year t+1 earnings issued over the period from the announcement of year t earnings to the approval date of the annual bonus plan for year t+1. If the approval date is missing, I use the end date of the three months after fiscal year-end as the approval date. If an analyst issues multiple forecasts during this period, I use only the most recent one. I average these analyst forecasts of year t+1 earnings to derive $Analyst\ forecast_{i,t+1}$. Analyst forecast data come from I/B/E/S.

TABLE 1
Sample Selection

S&P 1500 firm-years that use EPS as a performance measure for executive annual bonus contracts	2,723
Less firm years that lack EPS target information for executive bonus contracts	(936)
Sample firm years that have EPS target information	1,787
Less firm years that lack analyst forecast information on EPS	(478)
Sample firm years that have EPS target information and analyst forecast information	1,309
Less firm years that lack control variables	(192)
Sample firm years that have EPS target information, analyst forecast information, and control variables	1,117
Less firm years that lack two consecutive years' of data	(66)
Final Sample	1,051

This table presents my sample selection procedure.

TABLE 2
Descriptive Statistics

Measure	N	Mean	Median	Q1	Q3	Std. Dev.
$Target\ EPS_{i,t+1}$ - $Target\ EPS_{i,t}$	1,051	0.189	0.190	-0.070	0.490	0.795
$Target\ revision_{i,t+1}$	1,051	0.119	0.090	-0.036	0.221	0.434
$Actual\ EPS_{i,t}$ - $Target\ EPS_{i,t}$	1,051	0.000	0.050	-0.100	0.230	0.757
$Target\ deviation_{i,t}$	1,051	0.004	0.023	-0.047	0.106	0.480
$Analyst\ forecast_{i,t+1}$- $Actual\ EPS_{i,t}$	1,051	0.175	0.163	-0.077	0.400	0.734
$Analyst\ forecast\ dev_{i,t+1}$	1,051	0.113	0.075	-0.030	0.184	0.489
$Management\ forecast_{i,t+1}$- $Actual\ EPS_{i,t}$	598	0.094	0.110	-0.141	0.280	1.064
$Management\ forecast\ dev_{i,t+1}$	598	0.119	0.049	-0.062	0.113	2.185
$Market\ value_{i,t}$	1,051	13,069	3,670	1,314	11,587	27,397
$AT_{i,t}$	1,051	19,215	4,346	1,326	13,826	55,676
$Relative\text{-}to\text{-}peers_{i,t}$	1,051	0.864	0.700	-0.264	1.787	1.902
$Relative\text{-}to\text{-}forecasts_{i,t}$	1,051	0.032	0.024	-0.020	0.094	0.405
$Ret_{i,t}$	1,051	0.172	0.154	-0.062	0.356	0.417
$Growth_{i,t+1}$	1,051	0.178	0.144	-0.266	0.602	0.941

This table reports the descriptive statistics for key variables. The sample is 1,051 firm-year observations for the 2008-2014 period. ($Target\ EPS_{i,t+1} - Target\ EPS_{i,t}$) is the difference in target EPS between fiscal year t+1 and fiscal year t. ($Actual\ EPS_{i,t} - Target\ EPS_{i,t}$) is the difference between actual EPS for fiscal year t and target EPS for fiscal year t. $Market\ value_{i,t}$ is computed as the closing market price per share of firm i multiplied by the number of shares outstanding at fiscal year-end. $AT_{i,t}$ is the book value of total assets of firm i. See Appendix C for the definitions of other variables.

TABLE 3
Correlations

	Target EPS$_{i,t+1}$ − *Target EPS*$_{i,t}$	*Actual EPS*$_{i,t}$ − *Target EPS*$_{i,t}$	*Analyst forecast* $_{i,t+1}$ − *Actual EPS*$_{i,t}$
Actual EPS$_{i,t}$ − *Target EPS*$_{i,t}$	**0.607** ***		
Analyst forecast $_{i,t+1}$ − *Actual EPS*$_{i,t}$	**0.409** ***	**-0.261** ***	
Growth$_{i,t+1}$	**0.098** ***	-0.020	**-0.216** ***

This table shows the correlations among my key variables. The sample is 1,051 firm-year observations for the 2008- 2014 period. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix C for variable definitions.

TABLE 4
The Use of Analyst Forecasts in Target Setting (H1)

Panel A: Test of the Use of Analyst Forecasts in Target Setting

$$Target\ revision_{i,t+1} = \lambda_0 + \lambda_1\ Target\ deviation_{i,t} + \lambda_2\ Target\ deviation_{i,t} * D\_NEG_{i,t} + \lambda_3\ Analyst\ forecast\ dev_{i,t+1} + \lambda_4\ D\_NEG_{i,t} + \lambda_5\ Relative\text{-}to\text{-}peers_{i,t} + \lambda_6\ Ret_{i,t} + \lambda_7\ Growth_{i,t+1} + Year\ and\ industry\ fixed\ effects + \varepsilon_{i,t} \quad (1)$$

		Dependent Variable:		*Target revision*$_{i,t+1}$	
		OLS regression	Median regression	OLS regression	Median regression
Independent Variable	Pred.	(1)	(2)	(3)	(4)
Intercept		-0.015 (-0.60)	0.032 (1.01)	-0.005 (-0.21)	-0.001 (-0.09)
Target deviation$_{i,t}$	+	**1.325** *** **(14.85)**	**1.238** *** **(18.46)**	**1.300** *** **(12.59)**	**1.048** *** **(17.41)**
Target deviation$_{i,t}$ **D_NEG*$_{i,t}$	−	**-1.169** *** **(-11.50)**	**-1.027** *** **(-6.13)**	**-1.028** *** **(-7.81)**	**-0.404** *** **(-3.13)**
Analyst forecast dev$_{i,t+1}$	+			**0.260** *** **(3.90)**	**0.540** *** **(6.37)**
D_NEG$_{i,t}$	?	**-0.074** *** **(-3.64)**	**-0.068** *** **(-2.87)**	**-0.063** *** **(-3.29)**	**-0.035** ** **(-2.54)**
Relative-to-peers$_{i,t}$	−	**-0.017** *** **(-3.10)**	**-0.009** *** **(-2.84)**	-0.007 (-1.40)	-0.003 (-1.49)
Growth$_{i,t+1}$	+	**0.024** * **(1.94)**	**0.027** *** **(3.04)**	0.011 (0.99)	0.008 (1.64)
Ret$_{i,t}$	+	**0.118** *** **(3.43)**	**0.087** *** **(2.66)**	**0.070** ** **(2.21)**	0.022 (1.42)
Year fixed effects		YES	YES	YES	YES
Industry fixed effects		YES	YES	YES	YES
Number of observations		1,051	1,051	1,051	1,051
Adjusted R^2 (Pseudo R^2)		66.23%	40.31%	72.75%	51.46%

TABLE 4 (Continued)

Panel B: Robustness of Results to Outliers

Dependent Variable:		Target $revision_{i,t+1}$						
		5th and 95th percentiles winsorized	1st and 99th percentiles truncated	Studentized residual greater than 2 removed	Cook's D greater than 4/n removed	S&P 500 LargeCap only	S&P 400 MidCap only	S&P 600 SmallCap only
Independent Variables:	Pred.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		-0.003 (-0.21)	-0.005 (-0.21)	0.015 * (1.13)	0.012 (0.90)	0.047 (1.60)	-0.014 (-0.30)	-0.028 (-0.23)
Target $deviation_{i,t}$	+	**1.130** *** **(18.50)**	**1.300** *** **(12.59)**	**1.107** *** **(22.38)**	**1.074** *** **(20.27)**	**0.992** *** **(8.76)**	**1.517** *** **(7.38)**	**1.032** *** **(12.43)**
Target $deviation_{i,t}$ $*D\_NEG_{i,t}$	−	**-0.255** ** **(-2.54)**	**-1.028** *** **(-7.81)**	**-0.617** *** **(-6.94)**	**-0.552** *** **(-5.40)**	**-0.539** ** **(-2.00)**	-0.403 (-1.56)	**-0.706** *** **(-7.71)**
Analyst forecast $dev_{i,t+1}$	+	**0.525** *** **(10.77)**	**0.260** ** **(3.90)**	**0.442** *** **(9.74)**	**0.480** *** **(7.96)**	**0.460** *** **(2.93)**	**0.414** *** **(3.27)**	**0.173** ** **(2.22)**
$D\_NEG_{i,t}$	?	0.007 (0.54)	**-0.063** *** **(-3.29)**	**-0.060** *** **(-4.43)**	**-0.056** *** **(-3.71)**	**-0.043** * **(-1.74)**	**0.089** ** **(2.13)**	**-0.088** ** **(-2.24)**
Relative-to-$peers_{i,t}$	−	-0.002 (-0.62)	-0.007 (-1.40)	0.000 (-0.18)	0.000 (0.16)	0.002 (0.24)	-0.014 (-1.64)	-0.021 (-1.45)
$Growth_{i,t+1}$	+	-0.010 (-1.44)	0.011 (0.99)	**0.010** * **(1.94)**	0.009 (1.66)	-0.013 (-1.04)	-0.011 (-0.88)	0.023 (1.16)
$Ret_{i,t}$	+	**0.064** *** **(2.60)**	**0.070** ** **(2.21)**	**0.054** *** **(3.16)**	**0.049** *** **(2.60)**	0.080 (1.59)	-0.010 (-0.24)	**0.242** *** **(3.65)**
Year fixed effects		YES	YES	YES	YES	YES	YES	YES
Industry fixed effects		YES	YES	YES	YES	YES	YES	YES
Number of observations		1,051	997	989	991	486	273	292

Adjusted R^2	76.76%	72.75%	84.63%	81.91%	65.29%	83.61%	79.10%

Panel A reports the results of estimating Equation (1). The sample for Panel A is 1,051 firm-year observations for the 2008-2014 period. In Columns (1) and (3), OLS regressions are estimated and all *t*-statistics (in parentheses) are based on the standard errors clustered by firm. In Columns (2) and (4), median regressions are estimated and all *t*-statistics (in parentheses) are based on the standard errors from bootstrap resampling. All variables are winsorized at the top and bottom 1st percentiles. Panel B reports the results after removing outliers using various methods. Column (1) shows the results when all variables are winsorized at the top and bottom 5th percentiles. Column (2) presents the results when all variables are truncated at the top and bottom 1st percentiles. In Column (3), Equation (1) is re-estimated after removing firms that have absolute values of studentized residuals greater than 2 (Belsley et al. 1980). In Column (4), Equation (1) is re-estimated after removing firms with Cook's D value (Cook 1977) greater than four over the number of observations. In Column (5) to (7), I divide my sample into S&P 500 LargeCap, S&P 400 MidCap, and S&P 600 SmallCap. I re-estimate Equation (1) using each subsample. See Appendix C for variable definitions. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 5
The Effects of Analyst Forecast Noise and Analyst Information Advantage over Management on the Use of Analyst Forecasts in Target Setting (H2 and H3)

$$\begin{aligned} \textit{Target revision}_{i,t+1} = \; & \lambda_0 + \lambda_1 \textit{ Target deviation}_{i,t} + \lambda_2 \textit{ Target deviation}_{i,t} * \textit{D\_NEG}_{i,t} \\ & + \lambda_3 \textit{ Analyst forecast dev}_{i,t+1} \\ & + \lambda_4 \textit{ Analyst forecast dev}_{i,t+1} * \textit{Avg forecast error quartile}_{i,t} \\ & + \lambda_5 \textit{ Analyst forecast dev}_{i,t+1} * \textit{Forecast dispersion quartile}_{i,t+1} \\ & + \lambda_6 \textit{ Analyst forecast dev}_{i,t+1} * \textit{Avg cyclicality}_{i,t} + \lambda_7 \textit{ Avg forecast error quartile}_{i,t} \\ & + \lambda_8 \textit{ Forecast dispersion quartile}_{i,t+1} + \lambda_9 \textit{ Avg cyclicality}_{i,t} + \lambda_{10} \textit{ D\_NEG}_{i,t} \\ & + \lambda_{11} \textit{ Relative-to-peers}_{i,t} + \lambda_{12} \textit{ Ret}_{i,t} + \lambda_{13} \textit{ Growth}_{i,t+1} \\ & + \textit{Year and industry fixed effects} + \varepsilon_{i,t} \qquad (3) \end{aligned}$$

	Dependent Variable :	*Target revision*$_{i,t+1}$			
		OLS regression		Median regression	
Independent Variables:	Pred.	(1)		(2)	
Intercept		-0.019		-0.019	
		(-0.66)		(-1.42)	
Target deviation$_{i,t}$	+	**1.329**	***	**1.059**	***
		(12.89)		**(11.87)**	
Target deviation$_{i,t}$ **D_NEG*$_{i,t}$	−	**-1.046**	***	**-0.366**	**
		(-7.60)		**(-2.40)**	
Analyst forecast dev$_{i,t+1}$	+	**0.648**	***	**0.779**	***
		(4.39)		**(6.58)**	
Analyst forecast dev$_{i,t+1}$** Avg forecast error quartile*$_{i,t}$	−	**-0.092**	*	**-0.054**	*
		(-1.72)		**(-1.65)**	
Analyst forecast dev$_{i,t+1}$** Forecast dispersion quartile*$_{i,t+1}$	−	**-0.086**	*	**-0.105**	***
		(-1.86)		**(-2.65)**	
Analyst forecast dev$_{i,t+1}$** Avg cyclicality*$_{i,t}$	+	**0.350**	**	**0.304**	*
		(2.31)		**(1.74)**	
Avg forecast error quartile$_{i,t}$	?	-0.006		0.005	
		(-0.84)		(0.98)	
Forecast dispersion quartile$_{i,t+1}$	?	**0.015**	*	**0.016**	***
		(1.92)		**(3.40)**	
Avg cyclicality$_{i,t}$	?	-0.028		-0.030	
		(-1.11)		(-1.57)	
D_NEG$_{i,t}$	?	**-0.061**	***	**-0.022**	**
		(-3.05)		**(-2.29)**	
Relative-to-peers$_{i,t}$	−	-0.001		0.001	
		(-0.22)		(0.45)	
Growth$_{i,t+1}$	+	0.003		0.006	
		(0.35)		(1.42)	
Ret$_{i,t}$	+	**0.055**	*	0.008	
		(1.96)		(0.42)	
Year fixed effects		YES		YES	
Industry fixed effects		YES		YES	
Number of observations		1,026		1,026	

Adjusted R^2 (Pseudo R^2)	74.38%	52.94%

This table reports the results of estimating Equation (3). The sample is 1,026 firm-year observations for the 2008-2014 period. In Column (1), the OLS regression is estimated and all *t*-statistics (in parentheses) are based on the standard errors clustered by firm. In Column (2), the median regression is estimated and all *t*-statistics (in parentheses) are based on the standard errors from bootstrap resampling. See Appendix C for the variable definitions. For all specifications, year and industry fixed effects are included, where the industry fixed effects are based on the two-digit SIC codes. To eliminate the effect of outliers, all variables are winsorized at the top and bottom 1st percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 6

The Use of External Benchmark information on the Magnitude of Target Ratcheting

$$Target\ revision_{i,t+1} = \lambda_0 + \lambda_1\ Target\ deviation_{i,t} + \lambda_2\ Target\ deviation_{i,t} *D\_NEG_{i,t} + \lambda_3\ Target\ deviation_{i,t} *Relative\text{-}to\text{-}forecasts_{i,t} + \lambda_4\ Target\ deviation_{i,t} *D\_NEG_{i,t} *Relative\text{-}to\text{-}forecasts_{i,t} + \lambda_5\ Target\ deviation_{i,t} *Relative\text{-}to\text{-}peers_{i,t} + \lambda_6\ Target\ deviation_{i,t} *D\_NEG_{i,t} *Relative\text{-}to\text{-}peers_{i,t} + \lambda_7\ D\_NEG_{i,t} *Relative\text{-}to\text{-}forecasts_{i,t} + \lambda_8\ D\_NEG_{i,t} *Relative\text{-}to\text{-}peers_{i,t} + \lambda_9\ Relative\text{-}to\text{-}forecasts_{i,t} + \lambda_{10}\ Relative\text{-}to\text{-}peers_{i,t} + \lambda_{11}\ D\_NEG_{i,t} + \lambda_{12}\ Growth_{i,t+1} + \lambda_{13}\ Ret_{i,t} + Year\ and\ industry\ fixed\ effects + \varepsilon_{i,t} \quad (5)$$

		Dependent Variable : *Target revision*$_{i,t+1}$			
		OLS regression		Median regression	
Independent Variables:	Pred.	(1)		(2)	
Intercept		0.003		0.033	
		(0.15)		(2.10)	
Target deviation$_{i,t}$	+	**1.272**	***	**1.276**	***
		(20.09)		**(30.82)**	
Target deviation$_{i,t}$*$D\_NEG_{i,t}$	–	**-0.712**	***	**-0.528**	***
		(-8.16)		**(-7.95)**	
Target deviation$_{i,t}$**Relative-to-forecasts*$_{i,t}$	–	**-0.405**	***	**-0.259**	*
		(-3.68)		**(-1.91)**	
Target deviation$_{i,t}$*$D\_NEG_{i,t}$**Relative-to-forecasts*$_{i,t}$	+	**0.593**	***	**0.463**	***
		(3.85)		**(2.71)**	
Target deviation$_{i,t}$**Relative-to-peers*$_{i,t}$	–	**-0.094**	***	**-0.060**	**
		(-3.57)		**(-2.51)**	
Target deviation$_{i,t}$*$D\_NEG_{i,t}$**Relative-to-peers*$_{i,t}$	+	**0.133**	***	**0.119**	**
		(3.60)		**(2.57)**	
$D\_NEG_{i,t}$**Relative-to-forecasts*$_{i,t}$	?	0.049		-0.016	
		(0.60)		(-0.21)	
$D\_NEG_{i,t}$**Relative-to-peers*$_{i,t}$	?	-0.015		0.004	
		(-1.43)		(0.46)	
Relative-to-forecasts$_{i,t}$	–	-0.031		-0.005	
		(-0.59)		(-0.11)	
Relative-to-peers$_{i,t}$	–	0.003		-0.004	
		(0.43)		(-0.78)	
$D\_NEG_{i,t}$	–	-0.016		-0.010	
		(-0.66)		(-0.75)	
Growth$_{i,t+1}$	+	**0.019**	*	**0.021**	***
		(1.80)		**(2.62)**	
Ret$_{i,t}$	+	**0.185**	***	**0.100**	***
		(5.20)		**(3.74)**	

Year fixed effects	YES	YES
Industry fixed effects	YES	YES
Number of observations	1,051	1,051
Adjusted R^2 (Pseudo R^2)	63.66%	44.32%

This table reports the results of estimating Equation (5). The sample is 1,051 firm-year observations for the 2008-2014 period. In Column (1), the OLS regression is estimated and all *t*-statistics (in parentheses) are based on the standard errors clustered by firm. In Column (2), the median regression is estimated and all *t*-statistics (in parentheses) are based on the standard errors from bootstrap resampling. See Appendix C for the variable definitions. For all specifications, year and industry fixed effects are included, where the industry fixed effects are based on the two-digit SIC codes. To eliminate the effect of outliers, all variables are winsorized at the top and bottom 1st percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 7
Additional Analyses
Panel A: Comparing the Relative Importance of Analyst Forecasts Versus Management Forecasts in Target Setting

$$\begin{aligned} \textit{Target revision}_{i,t+1} = {} & \lambda_0 + \lambda_1 \textit{Target deviation}_{i,t} + \lambda_2 \textit{Target deviation}_{i,t} * \textit{D\_NEG}_{i,t} \\ & + \lambda_3 \textit{Analyst forecast dev}_{i,t+1} + \lambda_4 \textit{Management forecast dev}_{i,t+1} + \lambda_5 \textit{D\_NEG}_{i,t} \\ & + \lambda_6 \textit{Relative-to-peers}_{i,t} + \lambda_7 \textit{Ret}_{i,t} + \lambda_8 \textit{Growth}_{i,t+1} \\ & + \textit{Year and industry fixed effects} + \varepsilon_{i,t} \qquad (6) \end{aligned}$$

		Dependent Variable: *Target revision$_{i,t+1}$*				
Independent Variables:	Pred.	(1)	(2)	(3)	(4)	(5)
Intercept		0.052 (0.96)	0.065 (1.13)	-0.005 (-0.08)	-0.025 (-0.30)	0.010 (0.20)
Target deviation$_{i,t}$	+	**1.111** *** **(8.62)**	**1.064** *** **(12.31)**	**1.454** *** **(24.97)**	**1.081** *** **(7.45)**	**1.660** *** **(5.40)**
*Target deviation$_{i,t}$ *D_NEG$_{i,t}$*	–	**-0.741** *** **(-4.66)**	**-0.293** ** **(-2.30)**	**-1.048** *** **(-4.50)**	**-0.286** * **(-1.87)**	**-1.087** *** **(-2.83)**
Analyst forecast dev$_{i,t+1}$	+		**0.514** *** **(6.46)**	**0.346** ** **(2.48)**	**0.757** *** **(8.15)**	**0.258** ** **(2.00)**
Management forecast dev$_{i,t+1}$	+	**0.051** *** **(5.48)**	0.001 (0.08)		-0.010 (-0.65)	0.004 (0.46)
D_NEG$_{i,t}$	?	**-0.066** *** **(-3.63)**	**-0.026** ** **(-2.11)**	-0.022 (-0.30)	-0.042 (-1.60)	0.009 (0.36)
Relative-to-peers$_{i,t}$	–	**-0.011** * **(-1.86)**	-0.004 (-0.99)	**-0.033** * **(-1.95)**	**-0.016** * **(-1.85)**	-0.001 (-0.15)
Growth$_{i,t+1}$	+	**0.017** * **(1.94)**	0.005 (0.85)	-0.013 (-0.39)	0.020 (1.16)	**0.012** * **(1.77)**
Ret$_{i,t}$	+	**0.133** *** **(3.94)**	**0.057** ** **(2.41)**	0.014 (0.18)	-0.049 (-0.71)	**0.075** ** **(2.39)**
Year fixed effects		YES	YES	YES	YES	YES
Industry fixed effects		YES	YES	YES	YES	YES
Number of observations		598	598	453	97	560
Adjusted R^2		67.87%	81.09%	94.28%	94.14%	78.92%

TABLE 7 (Continued)
Panel B: The Correlation between Low (High) Bonus Targets and Walked-Down (Walked-Up) Analyst Forecasts

	Low bonus target$_{i,t+1}$	*High bonus target*$_{i,t+1}$	*Walked-down analyst forecasts*$_{i,t+1}$
High bonus target$_{i,t+1}$	**-0.965** ***		
Walked-down analyst forecasts$_{i,t+1}$	0.014	-0.020	
Walked-up analyst forecasts$_{i,t+1}$	-0.012	0.018	**-0.993** ***

This table reports the results of additional analyses. Panel A reports the results of estimating Equation (6). Panel B represents the correlation matrix for the relation between low (high) bonus targets and walked-down (walked-up) analyst forecasts. In Columns (1) and (2) of Panel A, the regressions are estimated using a reduced sample with firms that have issued management earnings forecasts for the 2008-2014 period. The results in Column (3) of Panel A are based on a reduced sample with firms that do not issue management earnings forecasts for the same period. The results in Columns (4) and (5) of Panel A are based on a sample that have issued management earnings forecasts (similar to the sample used in Columns (1) and (2) of Panel A), but *Analyst forecast dev*$_{i,t+1}$ is alternatively defined. In Column (4) of Panel A, *Analyst forecast dev*$_{i,t+1}$ is the difference between *Analyst forecast*$_{i,t+1}$ and *Actual EPS*$_{i,t}$ divided by *Target EPS*$_{i,t}$, where *Analyst forecast*$_{i,t+1}$ is the average of the most recent analyst forecasts of year t+1 earnings issued over the period from the announcement of year t earnings to the date of management forecast issuance. In Column (5) of Panel A, *Analyst forecast dev*$_{i,t+1}$ is the difference between *Analyst forecast*$_{i,t+1}$ and *Actual EPS*$_{i,t}$ divided by *Target EPS*$_{i,t}$, where *Analyst forecast*$_{i,t+1}$ is the average of the most recent analyst forecasts of year t+1 earnings issued over the period from the date of management forecast issuance to the approval date of the annual bonus plan for year t+1. The results in Panel B are based on individual analyst level data. The sample for Panel B consists of 585 observations at the firm-year-analyst level. All the regressions in Panel A are based on the OLS estimations, and the t-statistics in parentheses are based on standard errors clustered at the firm level. See Appendix C for variable definitions. For all specifications, year and industry fixed effects are included, where the industry fixed effects are based on the two-digit SIC codes. To eliminate the effect of outliers, all variables are winsorized at the top and bottom 1st percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 8

Test of the Use of Analyst Forecasts in Target Setting Based on Firm-Specific Time-Series Regressions

$$Target\ revision_{i,t+1} = \lambda_0 + \lambda_1\ Target\ deviation_{i,t} + \lambda_2\ Analyst\ forecast\ dev_{i,t+1} + \varepsilon_{i,t} \qquad (7)$$

Variable	Pred.	Mean	Z-Stat		STD	N
Intercept	?	0.015	4.73	***	0.08	66
Target deviation$_{i,t}$	+	1.054	47.71	***	0.43	66
Analyst forecast dev$_{i,t+1}$	+	0.687	40.14	***	0.40	66

This table reports the results of estimating Equation (7) using firm-specific time-series analysis. The sample size is reduced from 1,051 to 396 observations (66 firms) as I restrict the sample to firms that have no missing values of *Target revision*$_{i,t+1}$, *Target deviation*$_{i,t}$, and *Analyst forecast dev*$_{i,t+1}$ for all years in the sample period. Firm-specific regressions are estimated for each of these firms.

The Z-statistics are computed as follows: $Z = \frac{1}{\sqrt{N}} \sum_{j=1}^{N} \frac{t_j}{\sqrt{k_j/(k_j-2)}}$

where t_j = the t-statistic of the estimate of the parameters for firm j, k_j = the degrees of freedom in the regression for firm j, and N = the number of firms in the sample. Firm-specific regressions are useful when the parameters of regressions are independent across firms (Antle and Smith 1985; Healy, Kang, and Palepu 1987; Dechow, Huson, and Sloan 1994; Gaver and Gaver 1998). See Appendix C for variable definitions. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Essay 2 : The Structure of CEO Bonus Contracts: Evidence from S&P 1500 Firms

1. INTRODUCTION

The annual bonus of the Chief Executive Officer is one of the most important elements of the CEO compensation package (Frydman and Jenter 2010; Jensen and Murphy 2011; Guay, Kepler, and Tsui 2016). Jensen and Murphy (2011) argue that annual incentives are sometimes more effective in motivating executives than equity compensation because bonuses are paid annually by cash, whereas equity compensation is paid over longer intervals in unrealized gains in the form of stocks. Guay, Kepler, and Tsui (2016) similarly argue that the pay-for-performance sensitivity of cash compensation is steeper than that of the equity compensation *Delta*. Despite itsimportance, researchers have not paid much attention to the executive bonus plans, due to the lack of data availability.[1] Research topics for bonus contracts have also been limited. Most prior studies have been centered around target setting (Indjejikian and Nanda 2002; Leone and Rock 2002; Aranda, Arellano, and Davila 2014; Indjejikian, Matějka, Merchant, and Van der Stede 2014; Bol and Lill 2015) or performance measure selection (Banker and Datar 1989; Lambert and Larcker 1987; Sloan 1993; Bushman, Indjejikian, and Smith 1996; Ittner, Larcker, and Rajan 1997).[2]

[1] Prior studies in bonus compensation area use data from a single firm with several divisions (Leone and Rock 2002; Bouwens and Kroos 2011; Aranda, Arellano, and Davila 2014; Bol and Lill 2015) or survey data (Bushman, Indjejikian, and Smith 1996; Indjejikian and Nanda 2002; Indjejikian, Matějka, Merchant, and Van der Stede 2014a; Lamber and Lacker 1987).

[2] Arnaiz and Salas-Fumás (2008) is an exception. This paper analytically investigates the relation between the volatility and kurtosis of performance and PPS of bonus plans.

In 2006, the U.S. Securities and Exchange Commission (SEC) adopted the enhanced executive compensation disclosure rules for the listed U.S. firms. The new disclosure rules require firms to disclose detailed information on the top executive compensation packages in the proxy statement.[3] Recent papers extend research by taking advantage of the new executive disclosure rules. For example, Bennett, Bettis, Gopalan, and Milbourn (2015) revisit manager's earnings management behavior to beat compensation targets using Incentive Lab data.[4] Curtis, Li, and Patrick (2015) investigate the use of adjusted earnings in bonus contracts for S&P 500 firms. Kim and Shin (2017) study asymmetric target ratcheting using the newly disclosed data. Following recent research, the aim of this paper is to overview the comprehensive features of executive annual bonus plans and investigate the PPS of bonus plans using hand-collected data from the S&P 1500 firms' proxy statements.

I show that more than 60% of S&P 1500 firms use earnings measures to determine the annual bonus amount. The relative usage of performance measures varies across industries. For instance, industries in which managing margins is crucial to generating profits are more likely to select earnings measures. I also find a positive association between noise and the use of earnings measure (Lambert and Lacker 1987; Banker and Datar 1989). Furthermore, the 80/120

[3] See the SEC's final rule 33-8732a (https://www.sec.gov/rules/final/2006/33-8732a.pdf) for more detail.

[4] Incentive Lab is a database that covers long-term and short-term compensation targets and goals of large U.S. firms (S&P 500 and a significant portion of S&P 400) from 1998.

rule for performance standards holds for S&P 1500 firms. The average bonus cap is \$ 2,351,020 and the average bonus floor is \$ 376,732. The average bonus payouts in the incentive zone are convex, that is, the slope exceeding the bonus target is steeper than below the targets.

Prior studies have analyzed the relation between growth opportunities of firms and the sensitivity of equity compensation to performance and only found mixed results for the association between growth options and pay-for performance relation of bonus compensation (Smith and Watts 1992; Gaver and Gaver 1993; Baber, Janakiraman, and Kang 1996; Cadman, Klasa, and Matsunaga 2010). Using hand-collected data and appropriate performance variables when estimating pay-for-performance sensitivity, I find a positive association between firms' growth options and the PPS of bonus payouts after controlling for peer information (Aranda, Arellano, and Davila 2014) and other factors discussed in prior studies (Arnaiz and Salas-Fumás 2008). I also find that growth firms are more likely to use convex bonus payouts for the executive annual incentive plan.

This paper has several contributions. Prior research only briefly addresses the relation between pay-for-performance sensitivity of equity compensation and growth opportunities and find a positive association between these variables (Smith and Watts 1992; Gaver and Gaver 1993; Baber et al.1996). Researchers have not paid much attention to the relation between bonus PPS and growth options because the monetary incentives of bonus plans are much smaller compared to that of equity based plans (Jensen and Murphy 1990; Hall and Liebman 1998; Core et al. 2003). It is implicitly assumed that bonus compensation is less effective and the bonus related research is considered less important and have marginal contributions. However, recent studies such as Jensen and Murphy (2011) and Guay et al. (2016) argue that short-term bonuses are as effective as equity compensation and the structure of annual incentives is altogether different from the structure of equity incentives (Jensen and Murphy 2011). Therefore, it is important to study whether the findings for equity compensation can be applied to bonus compensation.

Second, this paper provides empirical results on the determinants of PPS of CEO bonus plans using a large cross-sectional sample. Prior studies on the PPS of executive bonus contracts derive results from an analytic model (Arnaiz and Salas-Fumás 2008) or focus more on the comparison between the equity compensation *Delta* and bonus PPS (Guay, Kepler, and Tsui 2016). The findings of this study may be more generalizable because the research model includes several important cross sectional control variables such as peer information in the research model, which have not been considered in prior studies.

Third, I find there is no association between bonus PPS or the convexity of bonus payoffs and *Delta*. These findings implicitly indicate that bonus contract design is different from equity compensation contract design. One of the reasons that bonus PPS has not been studied is that researchers have assumed that the PPS of total compensation is understood because equity compensation *Delta* has been thoroughly researched. However, the boards' motivation in setting bonus PPS could be altogether different from that of setting equity compensation *Delta*. This paper opens up an important yet unexplored area of research.

The remainder of this paper is organized as follows. Section 2 summarizes prior literature and develops the hypotheses. The research design and sample selection are described in Section 3. Section 4 reports empirical results, and Section 5 concludes.

2. RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

2.1 Annual Incentive Contract

Annual bonuses are still one of the most important elements in the CEO compensation package. Figure 1 illustrates the percentage of the annual bonus in the CEO total compensation from 2008 to 2014. The annual bonus is a substantially important part of CEO compensation and the average percentage of the annual bonus in CEO compensation is around 20%. In addition to the magnitude of annual bonus in total compensation, recent literature on annual bonus plans suggest that the magnitude of pay-for-performance sensitivity of annual bonuses is comparable to that of equity incentives and that annual bonuses provide significant incentives for new CEOs (Guay et al. 2016).

Jensen and Murphy (2011) also point out several reasons why annual bonus is effective in motivating managers. First, in general, CEOs receive annual bonuses for their accounting performance. CEOs have a thorough understanding of the various factors related to increasing accounting performance, whereas there is still ambiguity regarding the factors related to increasing stock prices used for stock compensation. Second, "the immediacy and tangibility of cash awards" of annual bonus plans may easily motivate CEOs to increase their effort. Third, performance measures for annual incentive contracts can be customized to each CEO. For example, "CEO succession planning" was the performance measure of the 2013 annual incentive plan for the CEO of Laboratory Corporation of America Holdings. In the 2014 proxy statement, Laboratory Corporation of America Holdings mentions that "In 2014, the Board approved the Senior Executive Transition Policy (the "Transition Policy") to reflect the belief that a strong succession planning process ensures the continued success of the Company while failure to ensure a smooth transition of leadership would have an adverse effect on the Company and its shareholders. The Compensation Committee continues to believe that the Transition Policy is important to strong succession planning for the Company's most senior positions." To motivate CEOs to be involved in the succession planning, the compensation committee included this aspect in the bonus contracts. In sum, annual bonus is a key element of the CEO compensation package that provides easy and direct motivation for CEOs.

(Figure 1 here)

As mentioned in Section 1, until recently, annual incentives have not attracted much attention from accounting researchers due to data limitations. However, after 2006, the SEC adopted new disclosure rules requiring firms to disclose their detailed executive compensation structures in the "Compensation Discussion and Analysis (CD&A)" section of proxy statements. Companies are required to document their performance measures, targets, and overall compensation structures for executive compensation contracts. Appendix A provides an example of the CD&A section for El Paso Electronic Company. El Paso Electronic Company not only discloses the performance measures used in CEO bonus contracts, but also provides the relative weights and standards for each performance measure. Thus, researchers can capitalize on this newly available data to understand the structure of annual bonus plans.

2.2 Pay-for-performance sensitivity

CEO annual bonus plans typically consist of three factors (Murphy 2001): 1) Pay-for-performance sensitivity (PPS), 2) performance targets or standards[5], and 3) performance measures.

PPS is the relation between compensation and performance. PPS is an example of results control, that is, "rewarding employees for generating good

[5] Performance standards are typically composed of a target, threshold, and maximum.

results" (Murphy and Van der Stede 2012). Well-designed PPS of bonus plans can motivate managers to generate positive results (Murphy and Van der Stede 2012). Early studies in PPS investigate the association between performance measured by ROA, ROE or stock returns and compensation (Baber et al. 1996). However, other than the relation between stock returns and compensation[6], the relation between ROA/ROE and compensation may not be an appropriate proxy for PPS because performance measures in bonus plans frequently differ and can be customized to each individual (Jensen and Murphy 2011).

Core and Guay (2002) develop more sophisticated PPS measures for equity compensation, *Delta* and *Vega*. *Delta* is the sensitivity of the option portfolio value to the stock price and *Vega* is the sensitivity of the CEO's incentive portfolio value to stock return volatility (Core and Guay 2002). Numerous studies have investigated the factors influencing *Delta* or *Vega* and the effect of *Delta* or *Vega* on managerial behaviors. On the contrary, pay-for-performance relation of annual incentive has not received much attention because annual bonus data was not available until 2006 and researchers considered the importance of annual bonus in total compensation to be marginal. However, as I mentioned in the previous section, the incentive power of annual bonuses are comparable to that of equity compensation. In addition, the performance

[6] The magnitude of stock compensation increases as the stock returns increases. Hence, the relation between stock returns and the amount of stock compensation is directly tied to pay-for-performance sensitivity.

measures and performance standards of annual bonus plans can be adjusted every year, which is almost impossible for equity compensation because previously awarded stock options cannot be canceled. It is much more straightforward and convenient for Compensation committees to modify the pay-for-performance sensitivity of bonus plans than to modify *Delta* or *Vega*. Therefore, understanding the nature of bonus PPS is very important for executive compensation research.

Arnaiz and Salas-Fumás (2008) provide a rare study on bonus PPS. Arnaiz and Salas-Fumás (2008) analytically investigate the sources of factors affecting pay-for-performance sensitivity and performance maximum of annual bonus plans. They find that the degree of PPS decreases and the performance maximum increases with performance volatility. The intuition behind these findings is that the performance volatility negatively affects the incentive power of risk averse agents. Thus, the pay-for-performance relationship of bonuses decreases as performance volatility increases. However, higher volatility of performance widens the informative area of performance measures, therefore, the bonus cap becomes higher. Arnaiz and Salas-Fumás (2008) also argue that PPS increases and the bonus cap decreases with the kurtosis of performance. They suggest that these results are driven by the logic that higher kurtosis is a proxy for the narrower range of informative performance measures, and "a narrower zone of informative realizations of the performance variable" makes the relation between performance and bonuses steeper.

Other than the volatility and kurtosis of performance, firms' growth opportunities could be a potential consideration when boards set executive bonus PPS. Firms with growth options would increase their value due by investing in positive NPV projects (Myers 1977). Growth firms are more likely to obtain future economic rents from these investments because patents or firm specific knowledge that create these rents cannot be easily imitated by competitors (Tirole 1988).

Several papers directly study the link between growth opportunities and pay-for-performance relation (Baber et al. 1996; Cadman et al. 2010). For example, Baber et al. (1996) investigate the cross-sectional association between the pay-for-performance sensitivity of CEO compensation and a firm's investment opportunities. If boards cannot easily understand the nature of growth options of the high growth firms, managers would have more room to manipulate their observable actions to their own benefit. The agency problem becomes more severe in growth firms (Smith and Watts 1992; Gaver and Gaver 1993). Thus, boards in growth firms would increase PPS to reduce agency conflicts. Indeed, Baber et al. (1996) find a significantly positive association between the compensation-stock return sensitivity and growth opportunities. However, they find an insignificant association between sensitivity of compensation to ROE and growth opportunities because accounting earnings are less informative than stock returns in capturing firms' growth (Smith and Watts 1992; Gaver and Gaver 1993). Hence, there can be no association between growth options and bonus PPS.

On the contrary, it is also possible that the findings of prior studies are driven by weak empirical models and that is the reason why prior studies cannot find significant results for the relation between the sensitivity of CEO compensation to accounting performance and investment opportunities. Baber et al. (1996) and Cadman et al. (2010) use ROE as the accounting performance measure when they test the relation of PPS and growth options because ROE is comparable to stock returns. However, in practice, ROE may not be the best proxy for accounting performance in bonus contracts. In my sample, only 3% of performance measures consist of ROE or ROA. However, EPS or unscaled earnings are the most widely used performance measures (Panel A, Table 3).

In addition, the assumption of prior studies (Baber et al. 1996; Cadman et al. 2010) that accounting performance is less informative than market performance for firms with investment opportunities may not be correct. I conjecture two reasons why accounting performance can be as informative as stock returns. First, compensation earnings and EPS are generally non-GAAP earnings (Curtis, Li, and Patrick 2017). If boards optimally adjust earnings to motivate managers, using adjusted earnings as performance measures can be also informative performance measures for growth firms. Second, expenses related to acquisitions are generally excluded when adjusting compensation earnings (Curtis et al. 2017). Similarly, managers' opportunistic R&D reduction to increase cash compensation has been considered to distort firms' growth. However, Cheng (2004) argue that there is no association between R&D reduction and the amount of cash compensation, suggesting that compensation committees effectively respond to managers' opportunistic R&D reduction. In sum, accounting performance measures may be more informative than the preoccupation of researchers. Therefore, it may be possible to find a significantly positive association between bonus PPS and growth options if appropriate performance measures are used when calculating PPS.

There is another argument for the relation between growth options and bonus pay-for-performance sensitivity. Several papers in psychology find that the existence of target based pay can demotivate managers to conduct "outside-the-box thinking" (Humphreys and Revelle 1984; Wood, Mento, Locke 1987). This is because executives would narrowly focus on beating given performance targets (Shapira 1976; Pittman, Emery, and Boggiano 1982). Thus, executives do not allocate their resources on risky projects but on foreseeable projects (Amabile 1996). Similarly, Webb, Williamson, and Zhang (2013) find that the participants of an experiment that are given target-based pay implement a lower number of production efficiencies than those with a fixed wage. If executives are pressured by the higher PPS of bonus plans and become fixated on narrow horizon accounting numbers or are motivated to cut important investment for the future profits ("managerial short-termism"), boards of growth firms would not set high PPS for their executive bonus plans.[7][8]

In sum, growth firms would have higher PPS for executive bonus plans to reduce agency problems. However, higher PPS could have an adverse effect for firms with growth options. Whether growth option firms prefer higher PPS of bonus plans is thus an empirical question. Therefore, I state my first hypothesis as follows:

Hypothesis 1: The steepness of pay-for-performance sensitivity of executive annual bonus contracts is not associated with the firm's growth options.

2.3 Pay convexity

Unlike risk neutral investors, risk averse managers do not prefer risky projects. The reason why boards set convex compensation payouts for their executives is to motivate managers to invest in risky projects. Prior studies show that the convex payout of the stock options could motivate managers to bear risk

[7] The problems from using of target based pay would be more severe for annual bonuses than for stock options. Prior studies show that long-term compensation effectively alleviates managerial short-termism (Dechow and Sloan 1991; Cheng 2004).

[8] 518 measure-years of the sample in this paper were EPS measures. About 80% of the EPS measures are non-GAAP EPS measures, suggesting compensation committees "adjust compensation to prevent executives from engaging in opportunistic behavior." (Dechow and Huson and Sloan 1994). Curtis, Li, and Pattrick (2017) also show similar results in that of the 1,083 earnings measure-years in their sample, 757 measure-years are non-GAAP earnings. However, it is impossible to eliminate managerial short-term behavior by adjusting earnings targets. For example, CEOs can manage real earnings to meet analyst forecasts (Roychowdhury 2006) or to control their future compensation targets (Bouwens and Kroos 2011). These activities can eventually negatively influence the firms' growth opportunities.

because they are not penalized by negative compensation for the losses (Smith and Stulz 1985; Smith and Watts 1992; Guay 1999; Gormley, Matsa, and Milbourn 2013). Smith and Stulz (1985) analytically suggest that managers with a convex utility function would bear risk when the manager's wealth is a convex function of the firm value, that is, when the managers receive stock options. Gormley, Matsa, and Milbourn (2013) find that managers cut R&D expenses, reduce leverage, and stockpile cash when they receive compensation with less convex payoffs. Therefore, typical growth firms are more likely to provide their executives stock based compensation to add convexity to their executive compensation package (Gaver and Gaver 1993; Anderson, Banker, and Ravindran 2000; Ittner, Lambert, and Lacker 2003). Following the intuition of this line of research, I predict that the payoffs of bonus plan would be also more convex for growth firms.

On the other hand, compensation with high convex payoffs also has several caveats. Laux (2014) finds that convex pay plans give CEOs incentive to manipulate earnings even when the boards award optimal long-term compensation plans. Boards depends on the accounting numbers generated by CEOs to determine whether or not to continue the invested projects. If a CEO has a more convex compensation payout, he/she may receive more payoffs when earnings are manipulated. When the earnings are manipulated, the investment decisions based on these earnings will be distorted. Boards may consider certain poor projects to be profitable and may continue to invest in the project. In the meanwhile, managers would be compensated for the manipulated earnings.[9] Prior research finds that firms with growth options are more likely to engage in earnings management (McNichols 2000; Lee, Li, and Yue 2006). Manipulated earnings in growth firms would lead to sub-optimal investment decisions (Laux 2014) that might be more problematic than earnings management in value firms because poor investment decisions would hurt the firms' growth potential.

This phenomenon would be more severe for bonus compensation because short-term bonuses are determined based on accounting numbers. Leone and Rock (2002) show that managers manipulate earnings using discretionary accruals to maximize their bonus. Bouwens and Kroos (2011) also find that sales decrease in the final quarter is positively associated with the next year's bonus target achievement. By nature, short-term bonus gives an incentive for CEOs to conduct earnings management. Therefore, boards in growth firms would reduce the convexity in executive bonus plans to mitigate the investment distortion created by earnings manipulation. The findings of these papers suggest a negative association between a firm's growth options and the convexity of bonus plans.

[9] Empirical papers show the mixed evidence for the relation between equity compensation (convex compensation payouts) and earnings manipulation. For example, Bergstresser and Philippon (2006) and Burns and Kedia (2006) find a positive relation, however, Erickson, Hanlon, and Maydew (2006) and Armstrong, Jagolinzer, and Lacker (2010) report that there is no concrete evidence that CEO equity compensation is positively associated with accounting fraud. Laux (2014) suggests that prior studies have missed the link between accounting manipulation and boards' investment decisions. When managers manipulate earnings, these earnings may also lead the boards' to continue poor investments that might be desirable for managers.

In sum, either direction is predictable for the relation between growth options and the convexity of executive annual bonus contracts. Therefore, the second hypothesis is stated as follows:

Hypothesis 2: The convexity of executive annual bonus payouts is not associated with the firm's growth options.

3. RESEARCH DESIGN AND SAMPLE

3.1 Research Design

I estimate the following regression to test Hypothesis 1:

$$\begin{aligned} Ch\_LogPPS_{i,j,t+1} = {} & \lambda_0 + \lambda_1\, Ch\_MTB_{i,t} + \lambda_2\, TAR\_DEV_{i,j,t} + \lambda_3\, Ch\_STD\_ROA_{i,t} \\ & + \lambda_4\, Ch\_KURT\_ROA_{i,t} + \lambda_5\, Relative\_To\_PeerLogPPS_{i,t} + \lambda_6\, Ch\_ROA_{i,t} \\ & + \lambda_7\, LogAT_{i,t} + \lambda_8\, Ch\_LogDelta_{i,t+1} \\ & + Year\ and\ Industry\ fixed\ effects + \varepsilon_{i,t} \qquad (1) \end{aligned}$$

The dependent variable is $Ch\_LogPPS_{i,j,t+1}$, which is the difference between $LogPPS_{i,j,t+1}$ and $LogPPS_{i,j,t}$. $LogPPS_{i,j,t}$ is the natural logarithm of the pay-for-performance sensitivity of a performance measure *j* for year *t*. I only use earnings measures in my test. I classify earnings measures as follows: earnings per share, operating earnings per share, net income, operating income, EBIT, EBITDA, income before extraordinary items, income before taxes. Pay-for-performance sensitivity is estimated as the change in the dollar value of the CEO's annual bonus compensation divided by actual performance change amounting to 1% of targets. The amount of CEO's annual bonus compensation is estimated by multiplying the weight of each performance measure in the bonus contract with the total bonus amount. I provide an example of the bonus PPS estimation in

Appendix B. My main variable of interest is $Ch\_MTB_{i,t}$, which captures a firm's growth opportunity.[10] $Ch\_MTB_{i,t}$ is the difference between $MTB_{i,t}$ and $MTB_{i,t-1}$. $MTB_{i,t}$ is the market to book ratio estimated as the market value of equity over the book value of total assets.

Prior target setting literature argues that future bonus targets are revised based on past performance (Indjejikian and Nanda 2002; Leone and Rock 2002; Aranda, Arellano, and Davila 2014; Indjejikian, Matějka, Merchant, and Van der Stede 2014; Bol and Lill 2015; Kim and Shin 2017). If the "80%/120%" rule[11] is the norm of performance plans, past performance should affect the pay-for-performance sensitivity because past performance would be associated with the performance maximum and the performance threshold through the performance target. The performance maximum, target, and threshold are all elements in estimating the PPS. Thus, I control for $TAR\_DEV_{i,t}$, which is the difference between current actual performance and current performance targets divided by current performance targets. Following the findings of Arnaiz, and Salas-Fumás (2008), I control for the volatility and kurtosis of ROA. I predict that the PPS is negatively related with the volatility of ROA and positively related with the kurtosis of ROA. $Ch\_STD\_ROA_{i,t}$ is estimated as $STD\_ROA_{i,t}$ minus $STD\_ROA_{i,t-1}$. $STD\_ROA_{i,t}$ is the standard deviation of $ROA_{i,t}$ over the past five years.

[10] I do not use research and development expense (xrd) to capture firm's growth options because earnings and R&D expenses are endogenously related.

[11] The 80%/120% rule indicates the practice of setting the performance maximum as 120% of the performance target and setting the performance threshold at 80% of the performance target.

$Ch\_KURT\_ROA_{i,t}$ is estimated as $KURT\_ROA_{i,t}$ minus $KURT\_ROA_{i,t-1}$. $KURT\_ROA_{i,t}$ is the kurtosis of $ROA_{i,t}$ over the past five years. $ROA_{i,t}$ is defined as income before extraordinary items of firm *i* for year *t* scaled by the average total assets of firm *i* for year *t*.

Peer information is an important factor in designing compensation contracts (Albuquerque 2009; Gong, Li, and Shin 2011; Aranda et al. 2014; Indjejikian et al. 2014a; Indjejikian et al. 2014b; Bol and Lill 2015). In addition, Park and Vrettos (2015) find that RPE features in compensation contracts are significantly associated with the sensitivity of the CEO's incentive portfolio value to stock return volatility (*Vega*). Thus I control for $Relative\_To\_PeerLogPPS_{i,t}$, which is the difference between the mean value of peer $LogPPS_t$ and firm's own $LogPPS_{i,j,t}$.[12] I define peer firms as the firms in the same two-digit sic code in the same year. To control for the firm's fundamental characteristics, I include $Ch\_ROA_{i,t}$ and $LogAT_{i,t}$. $Ch\_ROA_{i,t}$ is estimated as ROA $_{i,t}$ minus ROA $_{i,t-1}$. $LogAT_{i,t}$ is the natural logarithm of total assets. Because PPS of equity compensation can be associated with bonus PPS, I additionally control for $Ch\_LogDelta_{i,t+1}$, which is defined as the difference between $LogDelta_{i,t+1}$ and $LogDelta_{i,t}$. $LogDelta_{i,t}$ is the natural logarithm of stock option *Delta*, which is the

[12] To increase sample size, I construct peer portfolios based on industry and year. Results remain very similar to analyses using peer portfolios based on industry, performance measure, and year (the sample size is reduced to 796 measure-years.)

dollar change in the executive's wealth for a 1% change in stock price (Core and Guay 2002; Coles, Daniel, and Naveen 2006).

To test my second hypothesis, I construct the following model:

$$Ch\_LogConvex_{i,j,t+1} = \lambda_0 + \lambda_1\ Ch\_MTB_{i,t} + \lambda_2\ Ch\_STD\_CFO_{i,t} + \lambda_3\ Ch\_LogPPS_{i,j,t+1} + \lambda_4\ Relative\_To\_PeerLogConvex_{i,t} + \lambda_5\ Ch\_ROA_{i,t} + \lambda_6\ LogAT_{i,t} + \lambda_7\ Ch\_LogDelta_{i,t+1} + Year\ and\ Industry\ fixed\ effects + \varepsilon_{i,t} \quad (2)$$

The dependent variable is $Ch\_LogConvex_{i,j,t+1}$, which is the difference between $LogConvex_{i,j,t+1}$ and $LogConvex_{i,j,t}$. $LogConvex_{i,j,t}$ is the natural logarithm of $Convex_{i,j,t}$. $Convex_{i,j,t}$ is defined as the pay-for-performance sensitivity estimated between the performance maximum and the performance target divided by the pay-for-performance sensitivity estimated between the performance target and the performance threshold. Prior studies argue that firm risk is positively associated with the convex payout of CEO compensation (Smith and Stulz 1985; Smith and Watts 1992; Gaver and Gaver 1993; Guay 1999; Gormley, Matsa, and Milbourn 2013). I use $Ch\_STD\_CFO_{i,t}$ to capture firm risk. $Ch\_STD\_CFO_{i,t}$ is the difference between $STD\_CFO_{i,t}$ and $STD\_CFO_{i,t-1}$. $STD\_CFO_{i,t}$ is the standard deviation of $CFO_{i,t}$ over the past five years. The reason why I do no control for the volatility of ROA in equation (2) is that $Ch\_STD\_ROA_{i,t}$ could be interpreted as the noise in performance measure. Thus, I use cash flows as a proxy for the firm's fundamental performance. $CFO_{i,t}$ is the operating cash flows (OANCF) over average total assets. $Relative\_To\_PeerConvex_{i,t}$ is estimated as the mean value of peer $LogConvex_{i,t}$ minus firm's own $LogConvex_{i,j,t}$. Peer portfolios are constructed based on two-digit SIC code and year.

3.2 Sample Selection and Descriptive Statistics

My sample consists of S&P 1500 firms from 2008 to 2014, that uses earnings as their performance measure in bonus contracts. I classify earnings measures as follows: earnings per share, operating earnings per share, net income, operating income, EBIT, EBITDA, income before extraordinary items, income before taxes. I hand-collect bonus cap, target bonus, bonus floor, performance maximum, performance target, and performance minimum of each performance measure from the proxy statement. I obtain stock return data from CRSP and financial data from Compustat. I also use Execucomp to estimate *Delta*.

Table 1 summarizes the sample selection procedure. Among the S&P 1500 firms from 2008 to 2014, I collect 16,503 measures (6,674 firm-years). The sample is restricted to measures that are based on earnings. I exclude measure-years that lack measure threshold, target, and maximum information, as well as those with missing control variables and peer information. Because my research model requires lagged measure information, I further exclude measure-years that lack two consecutive years of data. The final sample for testing H1 and H2 consists of 1,381 measure-year observations (1,176 firm-years).

(Table 1 here)

Table 2 presents shows the descriptive statistics by firm. The mean (median) values of $ROA_{i,t}$ is 6.4% (5.4%) of average total assets. The means of standard deviation and kurtosis of $ROA_{i,t}$ are 0.032 and 0.563, respectively. The means and medians of $MTB_{i,t}$ are 1.209 and 0.904, respectively. The average $LogDelta_{i,t}$ is 5.499, which is comparable to the descriptive statistics ($LogDelta_{i,t}$: 5.456) of Kim and Shin (2017).

(Table 2 here)

4. EMPIRICA RESULTS

Panel A of Table 3 and Figure 2 shows the relative percentage of the use of performance measures in CEO bonus plans. Among 16,503 performance measures, the most widely used performance measures are *earnings* measures.[13] *Sales* measures are the second (11%), followed by *non-financial* measures (10%) and *cash flows* (5%). Typical non-financial measures are managing customer relations, beating strategic goals, and increasing CSR activities such as environmental protection.

(Figure 2 here)

Panel B of Table 3 represents the relative use of performance measures in bonus contracts by industry. Industries where profit margins are important prefer earnings measures. For example, over 75% of bonus amounts are determined based on *earnings* in the wholesale trade and retail trade industry. Firms in the

[13] Measures are classified as earnings measures if the performance measures are determined based on earnings per share, operating earnings per share, net income, operating income, EBIT, EBITDA, income before extraordinary items, or income before taxes.

construction industry are also more likely to use *earnings* measures (70%) in CEO bonus contracts. In the service industry, *sales* are quite important performance measure (21%) because profit is directly tied to sales figures in the service industry. Production growth (*other financial*) or developing new mines (*non-financial*) would be a core element for future profits in the mining industry. Thus, *other-fin* and *non-fin* measures are widely used in the mining industry.

Panel C of Table 3 tests the factors considered by the boards earnings measures are used in CEO bonus contracts. I do not make a specific hypothesis regarding this test. The following regressions are estimated to investigate the determinants of earnings measure use in annual bonus plans:

$$Earnings\_Ratio_{i,t+1} = \lambda_0 + \lambda_1 Earnings\_Ratio_{i,t} + \lambda_2 STD\_ROA\_Quartile_{i,t} + \lambda_3 Earnings\_Ratio_{i,t} * STD\_ROA\_Quartile_{i,t} + \lambda_4 ROA_{i,t} + \lambda_5 LogAT_{i,t} + \lambda_6 Ret_{i,t} + \lambda_7 MTB_{i,t} + Year\ and\ Industry\ fixed\ effects + \varepsilon_{i,t} \quad (3)$$

$Earnings\_Ratio_{i,t}$ is defined as a firm *i*'s weight of earnings measure used in CEO annual bonus plan for fiscal year *t*. Prior studies argue that the noise in performance measures is negatively associated with the use of those measures in the compensation package (Banker and Datar 1989; Lambert and Larcker 1987; Bushman, Indjejikian, and Smith 1996; Ittner, Larcker, and Rajan 1997). Therefore I control for $STD\_ROA\_Quartile_{i,t}$, which is the quartile rank of $STD\_ROA_{i,t}$. $Ret_{i,t}$ is the stock return of a firm *i* over the twelve months ending at the end of the fiscal year *t*. I exclude measure-years that lack control variables. The final sample size is 4,589 measure-years in Panel C.

In Column (1), *Earnings_Ratio*$_{i,t}$ has a significantly positive coefficient, suggesting that there is a serial correlation for the use of earnings measures in bonus contracts. In column (2), the coefficient of *Earnings_Ratio*$_{i,t}$**STD_ROA_Quartile*$_{i,t}$ is significantly negative (-0.017, *t*-value : -2.03), which means that boards place less weight on past *Earnings_Ratio* when earnings are noisy. This finding is very similar to the findings of prior studies arguing that the relative use of performance measures are negatively associated with the noise in those measures (Banker and Datar 1989; Lambert and Larcker 1987; Bushman, Indjejikian, and Smith 1996; Ittner, Larcker, and Rajan 1997).

(Table 3 here)

Table 4 reports the statistics regarding the threshold and maximum of performance measures used in annual bonus contracts. From 16,503 measure-years, I exclude measure-years that lack target information. The sample size is reduced to 3,121 measure-years. In Panel A, I show the overall firms' performance threshold and maximum. The mean performance threshold is 82.46% and the mean performance maximum is 120.94%, suggesting that the 80/120 rule holds in the sample. However, the 80/120 rule is not supported in some industries. Panel B presents the results by industry. For example, in the agriculture, forestry and fishing industry, the gap between the performance maximum and threshold is only 15% (104.72%-89.59%). On the contrary, the gap is over 70% (145.01%-71.18%) in the construction industry.

(Table 4 here)

Table 5 provides the descriptive statistics of the bonus cap and floor used in annual bonus contracts. The sample size is 2,581 firm-years, which is equal to that of Table 4. Panel A of Table 5 shows that the average bonus floor is 374,123 U.S. dollars and the average bonus cap is 2,315,801 U.S. dollars, which is approximately 6 times larger than the average bonus floor. Panel B presents the statistics by industry. The bonus floor in the agriculture, forestry and fishing industry has the lowest value (0), whereas the industry's bonus cap is similar to the average of entire sample. The bonus floor (453,335 U.S. dollars) is the highest in the transportation, communications, electric, gas, and sanitary service industry. The results in Table 3 and Table 4 indicate that the relative use of earnings measures in bonus plan and the performance maximum/threshold in the wholesale industry is very similar to that of the retail industry. However, the bonus cap in the retail industry (2,682,983 U.S. dollars) is much greater than bonus cap in the wholesale industry (1,788,622 U.S. dollars), which is different from the findings in Table 3 and Table 4.

(Table 5 here)

Table 6 describes the pay-for-performance sensitivity of CEO bonus contracts. Panel A provides the descriptive statistics for the pay-for-performance sensitivity. The average pay-for-performance sensitivity is around $47,102, suggesting that if CEOs increase their earnings performance by 1% of their performance targets, they can earn an additional $47,102 as bonuses.[14] The agriculture, forestry and fishing industry and the retail industry have the highest bonus PPS. On the other hand, the average bonus PPS in the Construction industry is below one fourth of the bonus PPS in the Retail industry.

Panel B shows that PPS in the incentive zone is often convex. Over 63% of performance measures use convex compensation functions, which is different from the findings of Murphy (1999).[15] Only 6% of the performance measures have linear bonus plans in the incentive zone. Figure 3 depicts the incentive zone of the entire sample. The average pay-for-performance relationship is convex, that is, the slope between the bonus cap and the target bonus is greater than the slope between the target bonus and the bonus floor.

(Figure 3 here)

Panel C of Table 6 shows the relative percentage of linear/convex/concave bonus payouts in the incentive zone by industry. There is a substantial difference between the wholesale industry and the retail industry. In the retail industry, bonus payouts are more likely to be concave (42.96%), whereas concave bonus payouts are less frequent in the wholesale industry (24.84%). Firms in the wholesale and the manufacturing industry mostly prefer a convex compensation function (69.57% and 67.39%, respectively).

[14] For example, the average EPS target in the sample is 2.76. This means that when CEOs increase their EPS by 0.28, he or she receives an additional $47,102 in bonuses.

[15] In Table 4 of Murphy (1999), 27% of firms in industrials use a convex compensation function in the incentive zone, followed by 14% in finance and insurance and 13% in utilities.

Panel D reports the results of testing equation (1). The coefficient for $Ch\_MTB_{i,t}$ is positively significant (0.128, *t*-value : 3.10), supporting the agency theory based explanation. Boards of growth firms increase the bonus plan PPS in an attempt to mitigate agency problems that arise due to the difficulty of understanding the nature of growth options. $TAR\_DEV_{i,j,t}$ also has a positive and significant coefficient (0.169, *t*-value : 2.92). Prior studies find that well-performing managers are compensated for receiving targets that are not based on past good performance (Aranda, Arellano, and Davila 2014; Indjejikian, Matějka, Merchant, Van der Stede 2014a). Under the assumption that the 80/120 rule holds, easier targets imply a narrower zone between the performance maximum and performance threshold, which leads to a sharper slope in the incentive zone. Similar to the intuition discussed in the recent target setting papers (Aranda, Arellano, and Davila 2014; Indjejikian, Matějka, Merchant, Van der Stede 2014a), well-performing managers are compensated for the higher PPS combined with easier targets that can increase their future bonus amount. Both $Ch\_STD\_ROA_{i,t}$ and $Ch\_KURT\_ROA_{i,t}$ do not have significant coefficients. These results may be driven by the fact that ROA may not be the best proxy for earnings measures.The coefficient of $Relative\_To\_PeerPPS_{i,t}$ is positive and significant, meaning that, boards increase PPS when the previous year's peer PPS is higher than the firm's own PPS. Boards adjust the pay-for-performance relation of executive bonus plans using the peer PPS as a benchmark.[16] Large firms are more visible and their executive compensation is more publicly investigated.[17] Therefore, larger firms tend to set a higher PPS. Lastly, $Ch\_Logdelta_{i,t+1}$ does not have a significant coefficient, implying that bonus PPS setting behavior is different from *Delta* setting behavior.

(Table 6 here)

The results in Table 7 show that boards increase convexity to the executive bonus payouts when growth opportunities increase, suggesting that boards place greater importance on motivating CEOs to carry out risky projects. The coefficient of $Ch\_MTB_{i,t}$ is positively significant at the 5% level (0.044, *t*-value : 2.17). $Ch\_STD\_CFO_{i,t}$ also has a significant and positive coefficient (1.654, *t*-value : 2.36). Boards increase the convexity to motivate risk averse managers to pursue more risky investments when the firms' past performance is volatile. Similar to the findings of Table 6, λ_4 is significantly positive. If the convexity of peer firm bonus plans is greater than the convexity for the focal firm, boards adjust their executive compensation contract to be more convex.

(Table 7 here)

[16] The intuition behind this finding is similar to that of Aranda, Arellano, and Davila (2014). Aranda, Arellano, and Davila (2014) suggest that the relative target difficulty using peer information negatively affects the following year's target revision.
[17] Hyun, Kim, Kwon, and Shin (2014) show that large firms try to hide the specific amount of executive compensation to reduce the political costs of disclosing higher executive pay.

5. CONCLUSION

In this paper, I overview the annual bonus contracts of CEOs using hand-collected data. I also empirically investigate the economic factors influencing boards' decision for setting pay-for-performance sensitivity and for increasing the convexity of executive bonus contracts. I find that earnings are the most widely used performance measure in bonus plans, and that the 80/120 rule holds in the sample. Firms with growth options are more likely to have executive bonus plans that have higher PPS and more convexity.

The limitation of this paper is that I have restricted my sample to firms that use earnings measures in CEO bonus contracts to maintain cross-sectional comparability. However, there are different characteristics among firms that use earnings, revenue, and other measures in bonus contracts. Therefore, my results might not fully explain the features of other performance measures.

Appendix A 2014 Proxy Statement of El Paso Electronic Company

2014 ANNUAL CASH BONUS PLAN

Metric	Weighting (%)	Performance Goals			Performance Result		
						Final Payout (as % of Target Bonus)	
		Threshold	Target	Maximum	Actual Result	CEO	Other NEOs (averaged)
EPS	50	$2.20	$2.30	$2.45	$2.27	39.7	38.2
Customer Satisfaction							
3rd Party Customer Survey	10	75	78	81	81	20	17.9
Call Center Performance (%)	10	70%	80%	90%	86%	16	14.7
Reliability (SAIDI) (min)	15	45.6 min	41.9 min	39.9 min	46.6 min	0	0
Safety							
DART (measure of injuries)	3.75	1.5	1.2	0.9	1.73	0	0
Vehicle accident	3.75	3.6	2.6	1.6	1.55	7.5	6.7
Leading Indicator activities	2.5	4 points	6 points	8 points	Maximum	5	3.7
Compliance	5	N/A	Fully Compliant	N/A	Target	5	5
Total	100					93.2	86.2

Bonuses are paid in late February or early March after the Compensation Committee reviews the audited financial results and operational performance for the previous year. As reported in the Annual Report on Form 10-K for the year ended December 31, 2014, and as shown in the above table, the Company had a net income of $2.27 per basic share, which includes an accrual for the cost of the bonus pool. The table shows that the Company also met (or failed to meet) its customer satisfaction goals, its reliability goal, its three safety goals and its compliance goal, respectively. As a result, each NEO received a bonus, as set forth in the table below and also in the Summary Compensation Table later in this proxy statement. The total bonus paid to Company employees for 2014 was approximately $7.4 million, of which approximately $1.9 million was paid to the NEOs and other executive officers.

Appendix B The example of Estimating Bonus Pay-for-performance Sensitivity using data from Monsanto Company

Year: 2014

Performance measure: EPS
The weight of EPS measure in bonus contracts: 50%

Bonus Floor (A)	Target Bonus (B)	Bonus Cap (C)	C-A
0	$803,513	$2,295,750	$2,295,750
PM Threshold (D)	PM Target (E)	PM Maximum (F)	F-D
$4.56	$5.09	$5.33	$0.77

Pay-for-performance Sensitivity
= {[(Bonus Cap – Bonus Floor) * PM weight] / (PM Max – PM Thr)} * 1% of PM Tar
= {[($2,295,750 – $0) * 50%] / ($5.33-$4.56)} * 1% of $5.09
= $1,490,747 * 0.0509 = $75,879

Appendix C Variable Definitions

Variable		Definition
$LogPPS_{i,j,t}$	=	The natural logarithm of pay-for-performance sensitivity of a performance measure *j* for year *t*. I only use earnings measures in my test. I classify earnings measures as follows: earnings per share, operating earnings per share, net income, operating income, EBIT, EBITDA, income before extraordinary items, or income before taxes. Pay-for-performance sensitivity is estimated as the change in the dollar value of the CEO's annual bonus compensation divided by the actual performance change amounting to 1% of targets. The amount of CEO's annual bonus compensation is estimated by multiplying the weight of each performance measure in bonus contracts with the total bonus amount.
$LogConvex_{i,j,t}$	=	The natural logarithm of $Convex_{i,j,t}$. $Convex_{i,j,t}$ is the pay-for-performance sensitivity estimated between the performance maximum and the performance target divided by the pay-for-performance sensitivity estimated between the performance target and the performance threshold.
$MTB_{i,t}$	=	The market to book ratio estimated as the market value of equity over the book value of total assets.
$TAR\_DEV_{i,t}$	=	The difference between the current actual performance and the current performance target divided by the current performance target.
$STD\_ROA_{i,t}$	=	The standard deviation of $ROA_{i,t}$ over the past five years.
$KURT\_ROA_{i,t}$	=	The kurtosis of $ROA_{i,t}$ over the past five years.
$ROA_{i,t}$	=	The income before extraordinary items of firm *i* for year *t* scaled by the average total assets of firm *i* for year *t*.
$STD\_CFO_{i,t}$	=	The standard deviation of $CFO_{i,t}$ over the past five years. $CFO_{i,t}$ is the operating cash flows (OANCF) over average total assets.
$Relative\_To\_PeerLogPPS_{i,t}$	=	The difference between the mean value of peer $LogPPS_t$ and firm's own $LogPPS_{i,j,t}$. I define peer firms as the firms in the same two-digit sic code in the same year.
$Relative\_To\_PeerLogConvex_{i,t}$	=	The difference between the mean value of peer $LogConvex_t$ and firm's own $LogConvex_{i,j,t}$. I define peer firms as the firms in the same two-digit sic code in the same year.
$LogAT_{i,t}$	=	The natural logarithm of total assets.

$LogDelta_{i,t}$	=	The natural logarithm of stock option *Delta*, which is the dollar change in the executive's wealth for a 1% change in stock price (Core and Guay 2002; Coles, Daniel, and Naveen 2006).
$Earnings\_Ratio_{i,t}$	=	A firm i's weight of earnings measure used in CEO annual bonus plan for fiscal year t.
$Ret_{i,t}$	=	The stock return of a firm i over the twelve months ending the end of the fiscal year t.
$STD\_ROA\_Quartile_{i,t}$		The quartile rank of $STD\_ROA_{i,t}$

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Figure 1
The percentage of Annual Bonus in CEO Total Compensation from 2008 to 2014

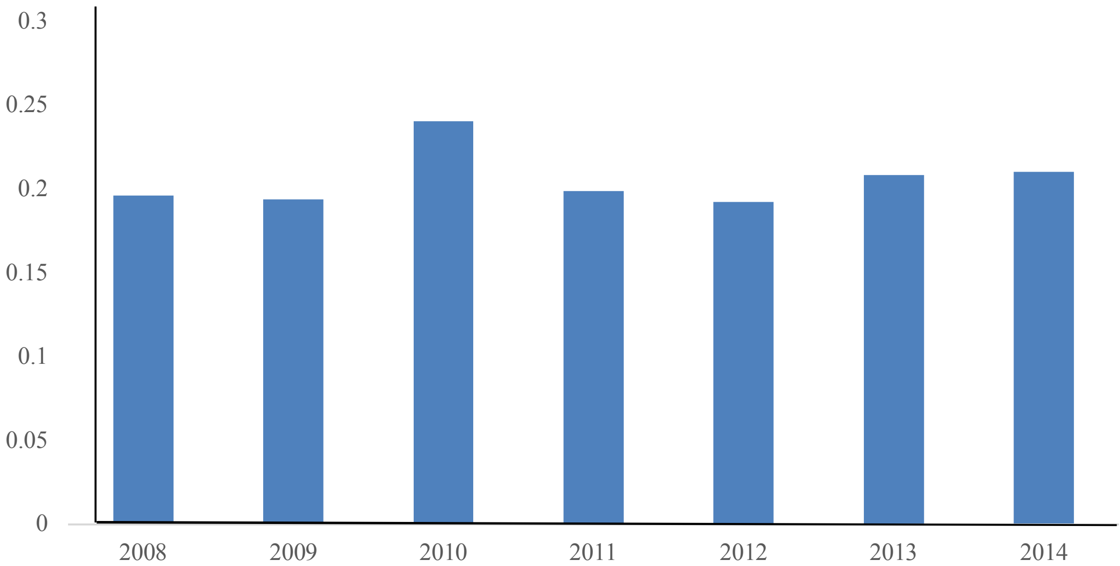

Figure 1 illustrates the percentage of annual bonus in CEO total compensation from 2008 to 2014.

Figure 2
The Distribution of Performance Measures Used in CEO Annual Bonus Plans from 2008 to 2014

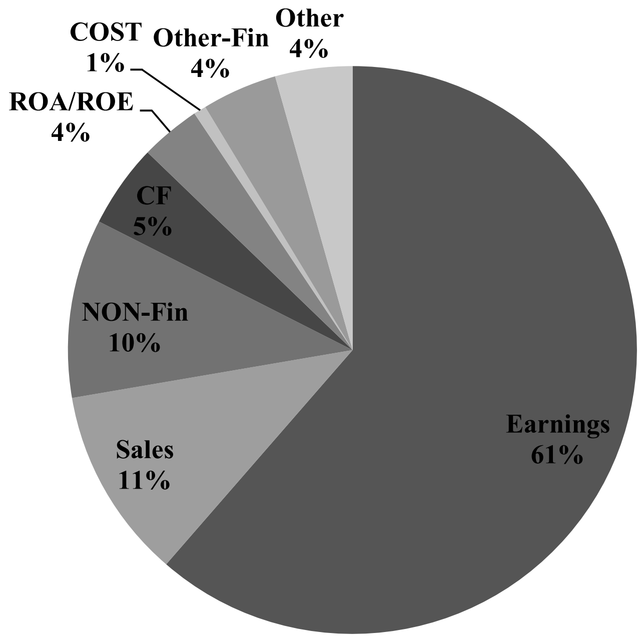

Figure 2 shows the distribution of performance measures used in CEO annual bonus plans from 2008 to 2014.

Figure 3
The "Incentive zone" of CEO Annual Bonus Plan Using S&P 1500 Firms from 2008 to 2014

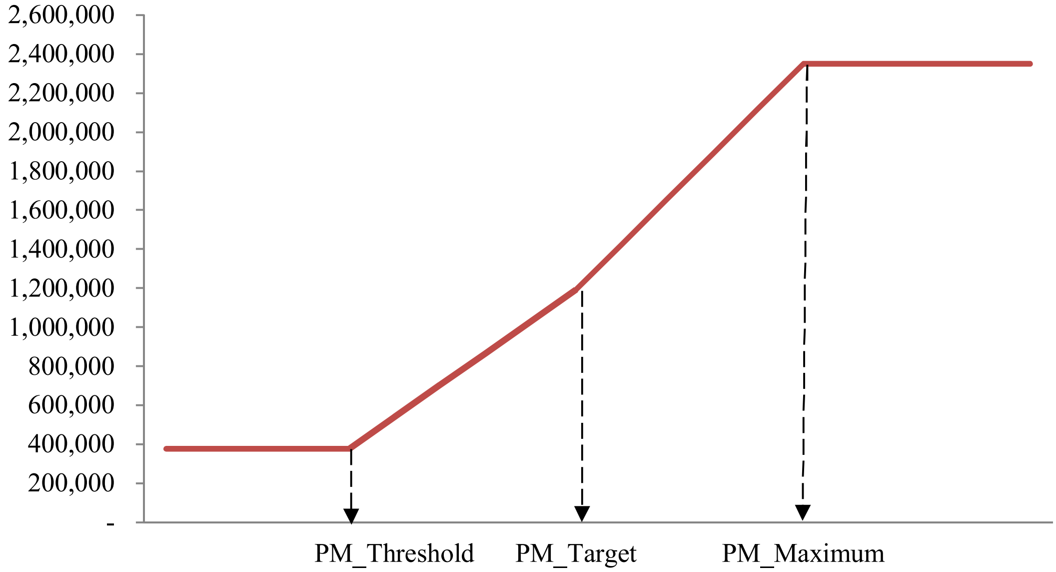

Figure 3 illustrates "Incentive zone" of CEO annual bonus contracts from 2008 to 2014 using S&P 1500 firms.

TABLE 1
Sample Selection

The performance measure-years of S&P 1500 firms with executive annual bonus contracts from 2008 to 2014	16,503
Less measure-years that are not earnings measures for executive bonus contracts	(9,028)
Sample earnings measure-years	7,475
Less measure-years that lack measure threshold/ target /maximum and pay floor/target/cap	(4,354)
Sample measure-years that have earnings target information	3,121
Less measure years that lack control variables and peer information	(1,544)
Sample measure-years that have target information and control variables	1,577
Less measure years of firms in the finance industry	(60)
Sample measure-years that have target information and control variables	1,518
Less measure-years that lack two consecutive years of data	(137)
Final Sample (measures)	1,381

This table presents my sample selection procedure.

TABLE 2
Descriptive Statistics by Firms

Measure	N	Mean	Median	Q1	Q3	Std. Dev.
ROA	1,176	0.065	0.055	0.032	0.093	0.057
LOGAT	1,176	8.248	8.192	7.297	9.157	1.376
STD_ROA	1,176	0.033	0.021	0.011	0.039	0.036
KURT_ROA	1,176	0.532	0.432	-1.390	2.309	2.293
MTB	1,176	1.209	0.904	0.542	1.510	0.990
LOGDELTA	1,176	5.499	5.528	4.637	6.360	1.308

Table 2 describes the descriptive statistics for my sample. The sample is 1,176 firm-year observations.

TABLE 3
Performance Measures Used in CEO Annual Bonus Plans

Panel A: The Distribution of Performance Measures Used in CEO Annual Bonus Plans (16,503 measures)

	Earnings	Sales	CF	ROA/ ROE	COST	Other Fin	Non-Fin	other
All firms	61%	11%	5%	3%	1%	4%	10%	4%

Panel B: The Distribution of Performance Measures Used in CEO Annual Bonus Plans across Industries (16,503 measures)

Industry	Earnings	Sales	CF	ROA/ ROE	COST	Other Fin	Non-Fin	other
Agriculture, Forestry and Fishing	59%	8%	31%	0%	0%	2%	0%	0%
Construction	70%	3%	5%	9%	2%	1%	6%	5%
Finance, Insurance and Real Estate	56%	5%	0%	10%	1%	11%	10%	7%
Manufacturing	61%	13%	7%	3%	0%	3%	10%	3%
Mining	40%	3%	5%	3%	4%	17%	16%	11%
Retail Trade	76%	10%	2%	1%	0%	2%	7%	2%
Services	62%	21%	3%	1%	0%	1%	9%	3%
Transportation, Communications, Electric, Gas and Sanitary Service	60%	4%	7%	3%	1%	5%	14%	6%
Wholesale Trade	79%	6%	1%	6%	0%	1%	4%	3%

Panel C: Earnings Selection Test

$$Earnings\ Ratio_{i,t+1} = \lambda_0 + \lambda_1\ Earnings\ Ratio_{i,t} + \lambda_2\ STD\ ROA\ Quartile_{i,t} + \lambda_3\ Earnings\ Ratio_{i,t} * STD\ ROA\ Quartile_{i,t} + \lambda_4\ ROA_{i,t} + \lambda_5\ LogAT_{i,t} + \lambda_6\ Ret_{i,t} + \lambda_7\ MTB_{i,t} + Year\ and\ Industry\ fixed\ effects + \varepsilon_{i,t} \quad (3)$$

Dependent Variable: *Earnings_Ratio* $_{i,t+1}$					
Independent Variables:	Pred.	(1)		(2)	
Intercept		0.098	***	0.087	***
		(4.65)		(4.18)	
$Earnings\ Ratio_{i,t}$	+	0.853	***	0.880	***
		(83.29)		(57.95)	
$STD\ ROA\ Quartile_{i,t}$	-	-0.003		0.007	
		(-1.58)		(1.26)	
$Earnings\ Ratio_{i,t} * STD\ ROA\ Quartile_{i,t}$	-			-0.017	**
				(-2.03)	
$ROA_{i,t}$	+	0.075	*	0.082	*
		(1.72)		(1.86)	
$LogAT_{i,t}$	?	-0.005	***	-0.005	***
		(-3.41)		(-3.32)	
$Ret_{i,t}$	?	0.025	***	0.025	***
		(3.47)		(3.46)	
$MTB_{i,t}$	-	-0.007	**	-0.007	***
		(-2.48)		(-2.59)	
Year fixed effects		YES		YES	
Industry fixed effects		YES		YES	
Number of observations (firm years)		4,589		4,589	
Adjusted R^2		79.23%		79.26%	

Panel A, Table 3 reports the performance measures used in CEO annual bonus plans of the U.S. firms. Panel B, Table 3 presents the distribution of performance measure usage by industry. The sample for Panel A and Panel B consists of 16,503 measures from 2008 to 2014. Panel C, Table 3 reports the results of estimating equation (3). The sample for Panel C is 4,589 measure-year observations for the 2008-2014 period. See Appendix B for the variable definitions. All variables are winsorized at the top and bottom 1 percentiles. Year and industry fixed effects are included. Industry fixed effects are constructed based on the two-digit SIC codes. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 4
Threshold and Maximum of Performance Measures Used in CEO Annual Bonus Plans

Panel A: Threshold and Maximum of Performance Measures Used in CEO Annual Bonus Plans (3,121 measures)

	PM Threshold	PM Maximum
All firms	82.46%	120.94%

Panel B: Threshold and Maximum of Performance Measures Used in CEO Annual Bonus Plan across Industries (3,121 measures)

	PM Threshold	PM Maximum
Agriculture, Forestry and Fishing	89.59%	104.72%
Construction	71.18%	145.01%
Finance, Insurance and Real Estate	84.90%	117.28%
Manufacturing	79.99%	122.22%
Mining	77.62%	125.38%
Retail Trade	87.12%	118.61%
Services	84.19%	117.76%
Transportation, Communications, Electric, Gas, and Sanitary Service	85.37%	121.82%
Wholesale Trade	81.44%	119.90%

Table 4 Panel A reports the average performance threshold and performance maximum of the sample. Panel B shows the average performance threshold and performance maximum by industry. The sample for Panel A and Panel B consists of 3,121 measures from 2008 to 2014.

TABLE 5
Floor and Cap of CEO Annual Bonus Plans

Panel A: Floor and Cap of CEO Annual Bonus Plans (2,581 firm-years)

	Bonus Floor	Bonus Cap
All firms	$ 374,123	$ 2,315,801

Panel B: Floor and Cap of Performance Measures Used in CEO Annual Bonus Plans across Industries (2,581 firm-years)

	Bonus Floor	Bonus Cap
Agriculture, Forestry and Fishing	$ 0	$ 2,295,750
Construction	300,287	2,339,061
Finance, Insurance and Real Estate	418,797	2,231,651
Manufacturing	358,085	2,419,424
Mining	313,877	2,009,860
Retail Trade	442,349	2,682,983
Services	297,159	1,902,553
Transportation, Communications, Electric, Gas, and Sanitary Service	453,335	2,521,269
Wholesale Trade	325,917	1,788,622

Table 5 Panel A reports the average bonus cap and bonus floor of the sample. Panel B shows the average bonus cap and bonus floor by industry. The sample for Panel A and Panel B consists of 2,581 firm-years from 2008 to 2014.

TABLE 6
Pay-for-Performance Sensitivity of CEO Annual Bonus Plans

Panel A: Pay for Performance Sensitivity in the "Incentive zone" (3,121 measures)

	PPS
Agriculture, Forestry and Fishing	$ 75,879
Construction	18,426
Finance, Insurance and Real Estate	46,584
Manufacturing	45,125
Mining	21,487
Retail Trade	75,624
Services	37,730
Transportation, Communications, Electric, Gas, and Sanitary Service	56,496
Wholesale Trade	41,923
Average	$ 47,102

Panel B: Shape of Pay for Performance Sensitivity in the "Incentive Zone" (3,121 measures)

	Linear	Convex	Concave
Shape of PPS in "Incentive Zone"	6.38%	63.35%	30.28%

Panel C: Shape of Pay for Performance Sensitivity in the "Incentive Zone" across Industries (3,121 measures)

	Linear	Convex	Concave
Agriculture, Forestry and Fishing	0.00%	100.00%	0.00%
Construction	2.38%	57.14%	40.48%
Finance, Insurance and Real Estate	9.89%	61.54%	28.57%
Manufacturing	5.83%	67.39%	26.78%
Mining	3.97%	61.11%	34.92%
Retail Trade	2.96%	54.07%	42.96%
Services	6.42%	59.51%	34.07%
Transportation, Communications, Electric, Gas, and Sanitary Service	8.32%	62.05%	29.64%
Wholesale Trade	5.59%	69.57%	24.84%

Panel D: Test for the Determinants of Pay-for-Performance Sensitivity

$$Ch\_LogPPS_{i,j,t+1} = \lambda_0 + \lambda_1\ Ch\_MTB_{i,t} + \lambda_2\ TAR\_DEV_{i,j,t} + \lambda_3\ Ch\_STD\_ROA_{i,t} + \lambda_4\ Ch\_KURT\_ROA_{i,t} + \lambda_5\ Relative\_To\_PeerLogPPS_{i,t} + \lambda_6\ Ch\_ROA_{i,t} + \lambda_7\ LogAT_{i,t} + \lambda_8 Ch\_LogDelta_{i,t+1} + Year\ and\ Industry\ fixed\ effects + \varepsilon_{i,t} \quad (1)$$

Dependent Variable:	$CH\_LogPPS_{i,j,t+1}$		
Independent Variables:	Pred.	(1)	
Intercept		-0.381 (-3.33)	***
$Ch\_MTB_{i,t}$	+	**0.128** **(3.10)**	***
$TAR\_DEV_{i,j,t}$	+	0.169 (2.92)	***
$Ch\_STD\_ROA_{i,t}$	-	-0.608 (-0.51)	
$Ch\_KURT\_ROA_{i,t}$	+	-0.001 (-0.15)	
$Relative\_To\_PeerLogPPS_{i,t}$	+	0.128 (8.53)	***
$Ch\_ROA_{i,t}$	?	0.521 (1.31)	
$LogAT_{i,t}$	?	0.057 (4.55)	***
$Ch\_LogDelta_{i,t+1}$	+	0.004 (0.13)	
Year fixed effects		YES	
Industry fixed effects		YES	
Number of observations (measure years)		1,381	
Adjusted R^2		11.78%	

Table 6 Panel A shows the average pay-for-performance sensitivity for all firms and for each industry. Panel B reports the shape of the pay-for-performance sensitivity for CEO annual bonus plans. Panel C shows the shape of the pay-for-performance sensitivity by industry. The sample for Panel A, Panel B, and Panel C consists of 3,121 measures from 2008 to 2014. Panel C, Table 5 presents the test results of estimating equation (1). The sample for Panel C is 1,381 measure-year observations for the 2008-2014 period. See Appendix B for the variable definitions. All variables are winsorized at the top and bottom 1 percentiles. Year and industry fixed effects are included. Industry fixed effects are constructed based on the two-digit SIC codes. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 7
Determinants of the Pay-for-Performance Sensitivity Convexity

$$Ch\_LogConvex_{i,j,t+1} = \lambda_0 + \lambda_1\ Ch\_MTB_{i,t} + \lambda_2\ CH\_STD\_CFO_{i,t} + \lambda_3\ Ch\_LogPPS_{i,j,t+1} + \lambda_4\ Relative\_To\_PeerLogConvex_{i,t} + \lambda_5\ Ch\_ROA_{i,t} + \lambda_6\ LogAT_{i,t} + \lambda_7\ Ch\_LogDelta_{i,t+1} + Year\ and\ Industry\ fixed\ effects + \varepsilon_{i,t} \quad (2)$$

Dependent Variable:		$Ch\_LogConvex_{i,j,t+1}$	
Independent Variables:	Pred.	(1)	
Intercept		0.001 (0.02)	
$Ch\_MTB_{i,t}$	+	**0.044** **(2.17)**	**
$Ch\_STD\_CFO_{i,t}$	+	1.654 (2.36)	**
$Ch\_LogPPS_{i,j,t+1}$	?	1.606 (2.28)	**
$Relative\_To\_PeerLogConvex_{i,t}$	+	0.033 (1.26)	
$Ch\_ROA_{i,t}$	?	0.286 (10.73)	***
$LogAT_{i,t}$	?	-0.382 (-1.50)	
$Ch\_LogDelta_{i,t+1}$	+	0.006 (1.01)	
Year fixed effects		YES	
Industry fixed effects		YES	
Number of observations (measure years)		1,381	
Adjusted R^2		14.35%	

Table 7 presents the test results of estimating equation (2). The sample for Table 7 is 1,381 measure-year observations for the 2008-2014 period. See Appendix B for the variable definitions. All variables are winsorized at the top and bottom 1 percentiles. Year and industry fixed effects are included. Industry fixed effects are constructed based on the two-digit SIC codes. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

국문초록

최고경영자 연간 성과급 계약에 관한 연구

본 졸업논문은 임원의 연간 보너스의 목표 설정을 결정짓는 요인에 대해 주로 연구하였다.
관리 회계의 과거 연구들은 상대평가 정보 등과 같은 외부 정보가 목표 설정에 활용됨을 발견하였다. 그러나 목표를 설정하는 과정에서 실제로 어떤 구체적인 정보들이 사용되는지에 대해서는 잘 알려져 있지 아니하다. 본 졸업논문의 첫번째 에세이는 애널리스트의 연간 이익 예측치가 임원의 보너스계약의 목표 설정에 미치는 영향을 연구하였다. 연구 결과는 다음과 같다. 첫째, 애널리스트의 연간 이익 예측이 기업의 보너스 목표 설정과 양의 관계가 있음을 밝혔다. 두번째로 목표 설정에서 애널리스트 예측치를 사용하는 것은 예측치에 오류가 많았을 경우 활용도가 떨어졌으며 반대로 애널리스트들이 기업의 내부자들보다 더 정확한 예측을 할 경우 활용도가 커짐을 확인하였다. 마지막으로 과거 성과가 애널리스트들의 이익 예측치보다

클 때 목표 설정 시 과거의 좋은 성과 (favorable variance)가 미치는 영향 (target ratcheting)이 감소하고, 반대로 과거의 나쁜 성과 (unfavorable variance)가 미치는 영향을 증가함을 발견하였다. 추가 분석 결과, 보너스 목표 설정이 기업 내부의 연간 계획에 영향을 받지 않음을 확인하였고, 애널리스트들의 성과 예측이 역으로 기업 내부의 연간 계획에 영향을 받지 않음을 확인하였다

최근의 연구에 따르면 연간 보너스는 주식 보상과 유사한 인센티브 효과가 있다고 주장하고 있다 (Frydman and Jenter 2010, Jensen and Murphy 2011, Guay, Kepler and Tsui 2016). 그러나, 매우 소수의 논문들만 연간 보너스에 대해 직접적으로 연구하였다. 두 번째 에세이의 목표는 1) 임원 연간 보너스 계획의 포괄적인 전망을 개관하고 2) 성과급 민감도 (performance-pay-of-performance sensitivity, 이하 “PPS“)의 결정 요인과 연간 인센티브의 볼록성을 조사하는 것이다. 본 연구에서는 목표 설정을 위한 80 / 120 % 규칙이 산업 전반에 걸쳐 평균을 유지한다는 것을 발견했다. 또한 기업의 성장성이 유사 기업의 성과급 민감도나 볼록성 및 기타 경제적 요인을 통제 한 후에도 기업의 성과급 민감도 결정에 중요한 요인임을 확인하였다.

주요어: *임원보상; 연간성과급; 애널리스트 예측치; 성과 목표; 성과급민감도; 보상 볼록성*

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