Essays on Executive Compensation

by

Shuo Wu

M.Phil., City University of Hong Kong, 2003
B.B.A., Peking University, 2000

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

Doctor of Philosophy

in

The Faculty of Graduate Studies
(Business Administration)

The University of British Columbia
(Vancouver)
November, 2009

Abstract

This thesis consists of two studies in the area of executive compensation. The first examines the effect of boards of directors' characteristics on the degree of compensation efficiency with respect to the use of private information. I predict and find that boards' competence both in information acquisition and in monitoring influence the extent to which boards use private performance measures in CEO compensation. Specifically, smaller and more independent boards with their CEOs as the board chair are more efficient in exploiting private performance measures. Furthermore, the better a board balances its information role with its monitoring role, the more efficient it is in exploiting private performance measures. No asymmetry is found in rewarding and punishing CEOs based on private information.

The second study investigates the mechanism to inflate the value of executive stock options after Sarbanes-Oxley Act Section 403 (SOX 403), which requires that executive option grants be reported to the SEC within two business days following the grant day. As this requirement largely restricts backdating of executive option grants, I examine whether firms that previously backdated resort to alternative strategies after SOX. Using firms that were relatively free from backdating before SOX as a control group, I find that in the post-SOX period previous backdating firms exhibit a significantly larger return reversal around option grant dates, suggesting some sort of opportunistic behavior is still going on in these firms. Furthermore, I find that post-SOX option grant filings of previous backdating firms are as timely as those of the non-backdating control group, and that the large return reversals are associated with a pattern consistent with strategic timing of grants and disclosures; that is, a larger proportion of option grants are issued

right after bad news (before good news) than right before bad news (after good news). These findings suggest that firms that previously backdated engage in strategic timing as an alternative mechanism to lower the grant-date stock price in the post-SOX period.

Table of Contents

List of Tables

List of Figures

Acknowledgements

I offer my enduring gratitude to the faculty, staff and my fellow students at the UBC, who have made my years at UBC an enjoyable experience. I owe particular thanks to Professors Kin Lo, Sandra Chamberlain and Qiang Cheng, who have supported me toward every milestone, and inspired me to pursue a life-long career as a researcher and a thinker. I thank Professor Jerry Feltham for enlarging my vision of accounting and providing theoretical training that will benefit all my empirical endeavors. I also thank Professors Joy Begley, Xia Chen, Hernan Ortiz Molina, and Dan Simunic for their advice on my research and support toward completion of my PhD degree. Special thanks are owed to my dearest parents, who have always been there for me, especially in adversity, and been proud of me for who I am.

Dedication

For my parents

Chapter 1—Introduction

Very few business topics attract as much public attention as executive compensation. This thesis consists of two studies in the executive compensation area, focusing on the role of the board of directors and managerial opportunism, respectively.

Setting executive compensation is one of the board's most important tasks. Prior research has examined the relation between board attributes and several indicators of compensation efficiency, such as the level of CEO compensation, pay-performance sensitivities, and management turnover (Core et al., 1999; Cyert et al., 2002; Grinstein and Hribar, 2004; Yermack, 1996; Weisbach, 1988). My first study fills the gap in the literature by exploring how boards affect another important dimension of compensation efficiency—the use of privately observed performance measures.

I find that boards better use private information about future firm performance in firms that have smaller and more independent boards and in firms that have CEOs as the board chair. In addition, a balanced board structure, which has the CEO chair the board when a large proportion of the directors are independent (or, more insiders sit on the board when the CEO and the board chair are separate), enhances the board's efficiency in exploiting private information. The findings are robust to a variety of alternative specifications, and to controls for the noise in the public performance measures and potential substitution of equity incentives for cash pay.

Managers can also influence their own compensation packages to maximize their payoffs (aside from responding to contractual incentives). My second study examines opportunistic timing of executive option grants and how regulation changes such

behavior. One most recently documented avenue through which managers inflate their stock-based compensation is "backdating" (Lie, 2005; Heron and Lie, 2007), that is, retroactively picking a date when the stock price of the company was particularly low as the option grant date. Backdating is no longer feasible after the passage of the Sarbanes-Oxley Act Section 403 (SOX 403), which requires that executive option grants be reported to the SEC within two business days following the grant day. My study addresses a timely issue as to whether and how managers continue opportunistic timing of executive options grants after the regulation.

Using firms that were relatively free from backdating before SOX as a control group, I find that in the post-SOX period previous backdating firms exhibit a significantly larger return reversal around option grant dates, suggesting some sort of opportunistic behavior is still going on in these firms. Furthermore, I find that previous backdating firms file their post-SOX option grants to the SEC in as a timely fashion as the non-backdating control group, and that the large return reversals are associated with a pattern consistent with strategic timing; that is, a larger proportion of option grants are issued right after bad news (before good news) than right before bad news (after good news). These findings suggest that firms that previously backdated engage in strategic timing as an alternative mechanism to lower the grant-date stock price in the post-SOX period.

In summary, my studies reveal that (1) using privately observed performance measure(s) is an important way through which boards can affect compensation efficiency; and (2) management opportunism is persistent, as reflected by the timing of executive option grants.

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Chapter 2—Private information in executive compensation: the information role vs. the monitoring role of the board[1]

2.1 Introduction

This paper investigates the impact of boards of directors' characteristics on the degree of compensation efficiency, focusing on the boards' use of private information. Boards can affect compensation efficiency by using private information about future firm performance to compensate CEOs for actions that are not currently observable to outsiders (Hayes and Schaefer, 2000).[2] It is important to study boards' use of private information because it is a clearer indication of compensation efficiency compared to other indicators such as compensation levels and pay-performance sensitivities. Aside from efficiency, it is less likely that boards of directors have other motives for using private performance measures (in addition to public ones).

Setting executive compensation is one of the board of directors' most important tasks. As insiders who work closely with executives, directors have a more complete view of managers' work than that available to outsiders. Specifically, directors possess private knowledge (not observable to the public) about certain CEO actions, such as strategic planning and innovation development, which impact firms in the long run but are not captured by current observable performance measures. Recent research finds evidence that boards use their private information about CEOs as an additional input in compensation contracts (Hayes and Schaefer, 2000; Gibbs et al., 2004). This practice can

[1] A version of this chapter will be submitted for publication. Wu, S. Private information in executive compensation: the information role vs. the monitoring role of the board.

[2] Empirically, the use of private information is captured by the link between compensation and future firm performance, after controlling for public performance measures that are currently available.

improve compensation efficiency by mitigating management's myopic focus on current performance and reducing the noise in performance measures.

The role of the board in compensation efficiency has drawn increasing attention of the public and academia in recent years. Existing literature has examined the relation between board attributes and several indicators of compensation efficiency, such as the level of CEO compensation (Core et al., 1999; Cyert et al., 2002; Grinstein and Hribar, 2004), pay-performance sensitivities (Yermack, 1996), and replacing management for poor performance (Weisbach, 1988). In comparison, the use of privately observed performance measures is a clearer indicator of efficiency, because it is less likely that the board has other motives for using them. Boards do not have incentives to window dress (e.g. set high pay-performance sensitivities) for public relation purposes, because whether and how compensation is contracted on private performance measures cannot be observed by outsiders. Neither do boards have incentives to put a larger weight than optimal on private performance measures, given that it is costly to compensate CEOs based on what is unobservable and difficult to justify.

The impact of the board on the use of private information in CEO compensation—an important dimension of compensation contracting and a clearer indication of efficiency—has not yet been studied in the literature. This paper intends to fill this gap by examining the relation between a board's attributes and the extent to which it exploits privately observed performance measures to improve compensation efficiency.

Boards of directors can facilitate the use of private information in two ways: the first is through acquiring precise information about CEO actions that are not captured by public performance measures; the second is through board governance to deter opportunistic use

of information that is privately observed (or, to ensure that contracts are efficiently written on such information). A board's capability regarding the first task can be described as its "information role"; while its function regarding the second task can be labeled as its "monitoring role" (or "contracting role") [3]. The information role is often neglected in prior compensation research, which focuses only on the use of public performance measures. Prior research emphasizes the monitoring role of the board; empirically, CEO compensation is linked to publicly observable measures such as accounting performance or stock returns (i.e., no private information is involved). However, when private performance measures are taken into consideration, the information role of the board becomes crucial because private information has to be acquired first before it can be used in compensation decisions.[4] Therefore, a distinct feature of this research is that the board has to be competent in both the information role and the monitoring role to achieve efficiency. As many board attributes are associated with strength in one role and weakness in the other, a board with a well-balanced design that accommodates both roles would be the most desirable.

The private information that the board has access to cannot be observed by researchers; rather, it needs to be inferred from public information. If CEO compensation is based on both publicly and privately observed performance measures, the residual

[3] Note that the 'monitoring role' here specifically refers to monitoring the appropriate use of private information in compensation contract; that is, given the private signals the board receives it will write a compensation contract that maximizes the shareholders' interest. This notion of monitoring is different, or narrower, than the general reference to board monitoring. Alternatively, "contracting role" can be a more specific label. The current label is adopted for the ease of presentation and reference to the literature,

[4] Well-governed boards (with strong monitoring role) would set compensation efficiently; nevertheless, the optimal contracts are optimal solutions under certain constraints, including the quality of performance measures. Therefore, if two boards have private information of the same quality, the better-governed board would set compensation more efficiently based on this information than the poorly-governed one. On the other hand, given that two boards are equally strong in governance, the board with more precise private information could achieve a higher degree of compensation efficiency because of further reduction in noise.

(later referred to as 'residual compensation') from regressing CEO compensation on current public performance measures serves as a proxy for private information of the board. This proxy is noisy because the residual potentially contains both private information regarding CEO actions and other factors driving compensation but orthogonal to current performance.

I examine the relation between future firm performance and current residual compensation, similar to the design developed in Hayes and Schaefer (2000). Since the private information received by the board can reveal the impact of CEO actions on long-term firm value, it should therefore have a positive association with future firm performance. If no private information is used in CEO compensation, the residual term would contain only those factors that are orthogonal to future firm performance. As the private information component is afforded larger weight, a stronger relation should be observed between future performance and residual compensation.

Board characteristics are predicted and found to have significant impact on the use of private information in compensation. Specifically, the relation between future performance and residual compensation is found to be stronger for firms with smaller and more independent boards and for firms with their CEOs as the board chair. Consistent with prior literature, the findings of this study support the view that smaller boards are more efficient in obtaining information and making decisions. The results on board independence, combined with evidence from prior studies, suggest that the monitoring role of the board is important for deterring opportunistic use of private information. The dual arrangement of the CEO being the Chair of the Board (CEO/COB), on the other hand, strengthens the information role of the board through efficient communication

between the CEO and the other directors; therefore, private information of higher quality can be obtained and incorporated into the compensation contract. Since board independence and the CEO/COB arrangement each lends strength in one role and weakness in the other, combining these two measures gives a proxy for "balance": a board is more balanced if it has a CEO/Chair when a large proportion of the directors are independent (or, more insiders sit on the board when the CEO and the board chair are separate). Firms with more balanced boards exhibit a stronger relation between future performance and residual compensation.

This paper relies on the assumption that using private (in addition to public) information in compensation is efficient. Although a relatively weak assumption, it could be argued that firms are not uniform as to whether public or private performance measures serve as better signals for CEO's actions; therefore, the extent to which they are used in compensation contracts differs across firms. To address this issue, I focus on a relatively homogeneous sample of firms with volatile accounting earnings and stock returns. Agency theory predicts that these firms need to contract on performance measures other than what is publicly available to improve compensation efficiency. Consistent with the full-sample results, a smaller and better balanced board of directors is shown to be more efficient in using private information in compensation.

To further differentiate the use of private information for compensation efficiency from boards' opportunistic behavior, this paper also examines whether boards reward good and bad private performance asymmetrically. The results show no asymmetry in rewarding CEOs for good future prospects and punishing them for bad ones. This evidence corroborates that it is for the purpose of enhancing compensation efficiency that

boards of directors link CEO compensation to privately observed performance measures besides public ones.

This paper has three contributions. First, it extends the literature on the board's role in executive compensation. Specifically, this paper examines the board's role in another dimension of compensation efficiency: the use of privately observed performance measures in addition to publicly available ones. Although prior evidence is abundant on how boards affect the alignment of CEO compensation with public performance measures (e.g., pay-performance sensitivity, turnover-performance sensitivity, etc.), little is known about board efficiency in exploiting private information to compensate CEOs.

Second, this paper extends the literature on the role of corporate boards by examining both their monitoring and information roles. Prior research largely emphasizes the monitoring role of the board, arguing that board members should be independent from corporate executives to improve governance, enhance firm value, and achieve optimal compensation contracts (Fama, 1980; Fama and Jensen, 1983; Brickley et al., 1994; Core et al., 1999). However, recent work by Adams and Ferreira (2007) suggests that it is as important, if not more important, for the board to obtain high quality information about the firm, and that stressing the monitoring role alone is not optimal, as the quality of information received by the board would be sacrificed[5].

Third, this paper also complements studies examining board efficiency. Due to the difficulty of capturing the work of the board, prior research often infers its efficiency by relating board characteristics to the choices firms make (e.g., earnings management),

[5] Loosely, this is analogous to the balance between relevant and reliable financial reports. Reliable financial statements improve the ability of users to monitor the firm but reduce the relevance (informativeness) of the accounting numbers for valuation purposes.

based on strong and debatable assumptions about what choices are optimal. (For example, a lower accrual level is not necessarily better because some degree of earnings management is potentially desirable). In contrast, this paper relies on the relatively weak assumption that using private (in addition to public) information in compensation is efficient.

The remainder of this paper is organized as follows: Section 2 reviews the prior literature and develops testable hypotheses. Section 3 details the research design and describes the data. Section 4 presents the empirical results, and section 5 concludes the study.

2.2 Prior research and hypotheses

Compensation committee reports contained in firms' proxy statements often indicate that the amounts of bonuses awarded to managers are based not only on observable performance measures but also on strategic factors or subjective individual measures that are privately observed by the board of directors. For example, the following is an excerpt from the Walt Disney Company Notice of 2007 Annual Meeting and Proxy Statement:

> …the Compensation Committee…sets performance goals for the Company. Seventy percent of the preliminary bonus determination for each named executive officer is based upon performance against these goals. …the Committee also sets individual performance measures for each named executive officer. These measures allow the Committee to play a more proactive role in identifying performance objectives beyond purely financial measures, including,

for example, **exceptional performance of each individual's functional responsibilities as well as leadership, creativity and innovation, collaboration, diversity initiatives, growth initiatives and other activities that are critical to driving long-term value for shareholders** [emphasis added].

2.2.1 Prior literature

Prior research finds evidence of the adoption of privately observed performance measures in compensation contracts. With a sample of 317 firms, Ittner, Larcker and Rajan (1997) show that firms use other performance measures besides the publicly observable ones in CEO bonus contracts (36% of firms employ non-financial measures in evaluating CEO performance). Hayes and Schaefer (2000) find evidence that CEO bonuses reflect private board information regarding the contribution of a CEO's current actions to future firm performance. More recent research also documents wide-spread use of unverifiable performance measures in CEO bonuses (Gibbs et al., 2004).

Theoretical research shows that it is optimal to have compensation contracts based on privately observed performance measures in addition to public ones. The mechanism of bonus compensation enables the board to exploit non-contractible (non-verifiable) information to motivate the executives (Baiman and Rajan, 1995; Rajan and Reichelstein, 2006; Hayes and Schaefer, 2005) and thus provides a strict Pareto improvement (Baiman and Rajan, 1995). Murphy and Oyer (2003) argue that rewarding executives based on a subjective assessment of how their current activities have created long-run value can reduce the possibility of manager myopia.

The question left unanswered, however, is: what board characteristics facilitate the employment of private information and thus help improve compensation efficiency? Prior research shows that boards of directors have great impact on the efficiency of CEO compensation. For example, Core et al. (1999) find that CEO compensation is abnormally high when board governance is less effective; Yermack (1996) shows evidence that CEO compensation exhibits greater sensitivity to performance in companies with smaller boards. There is no research to date that examines how boards' characteristics affect the use of private information in compensation contracts.

2.2.2 Hypothesis development

2.2.2.1 Use of private information in compensation

To capture the private information contained in CEO compensation, this paper adopts a modified version of Hayes and Schaefer's model (2000), which relates future firm performance to the component of current CEO compensation that cannot be explained by current observable performance measures. The rationale is as follows.

If CEO compensation is based on both publicly and privately observed performance measures, the residual from regressing CEO compensation on current public performance measures serves as a proxy for private information of the board. This proxy is noisy because the residual potentially contains both private information regarding CEO actions and other factors driving compensation but orthogonal to firm performance. To reduce the noise, this residual is then related to future firm performance. Because private information of the board reveals the impact of CEO actions on long-term firm value, it has a positive correlation with future firm performance. But other factors, being orthogonal to firm performance, have no correlation with future performance. Therefore,

a positive relation between future performance and residual compensation suggests that private information has been incorporated into the compensation contract. See the Appendix for a model illustration.

2.2.2.2 Impact of the board of directors

The relation between future performance and residual compensation is a function of both the quality of private signals and the governance strength of the board. First, the weight of private information in compensation contracts increases with its precision. Assume that private information is a noisy presentation of CEO actions: $y_{pri,t} = a_t + \varepsilon$. Standard agency theory predicts that in an optimal contract the weight of a performance measure is positively (negatively) related to its precision (noisiness). Therefore, the more precise the information obtained by the board, the larger weight it will carry in the compensation contract and the stronger the correlation will be between future performance and current unexplained compensation. Second, board governance is needed to enhance the alignment of CEO compensation with future firm performance. Without effective governance, risk-averse CEOs would prefer contracts that come with lower sensitivities of pay to performance (both contemporaneous and future) and a higher level of certainty equivalent. Such arrangements would allow them to secure more compensation or exert less effort. Therefore, weak governance would attenuate the relation between future performance and current unexplained compensation as weight shifts from private information to other factors that do not affect performance.

It follows that boards of directors can facilitate the efficient use of private information in two ways: the first is through acquiring precise information about CEO actions beyond what is publicly observable; the second way is through board oversight to enforce the link

between CEO compensation and future performance. Negligent boards can forgo the signals about future performance and reward the CEO at their discretion, regardless of the content of their private information. Board oversight is important to reduce such unproductive behavior. The board's capability regarding the first task can be described as its "information role", while its function regarding the second task can be described as its "monitoring role". The board has to strike a balance between these two roles to achieve efficiency.

2.2.2.3 Monitoring role of the board

Prior literature has shown that board characteristics are associated with the strength of board monitoring. First of all, the inclusion of independent directors can enhance the effectiveness of the boards' monitoring function (Fama, 1980; Fama and Jensen, 1983). Prior research shows that companies with more independent boards have stronger governance as evidenced by their better firm performance (Brickley et al., 1994; Byrd and Hickman, 1992; Weisbach, 1988) and that the inclusion of a larger proportion of outside directors reduces the likelihood of financial fraud (Dechow et al., 1996; Beasley, 1996). Independent directors are also presumed to be important in setting efficient compensation contracts that serve shareholders' interests. For instance, the level of CEO compensation is found to be lower when the board consists of more independent directors (Hallock, 1997; Core et al., 1999). I conjecture, similarly, that independent directors would have stronger incentives to improve compensation efficiency through acquiring information about CEO actions beyond what is publicly available and using such information to reward or punish CEOs.

Second, smaller sized boards are found to be more efficient monitors. Yermack (1996) shows that companies with smaller boards experience higher market values and exhibit stronger pay-performance sensitivities in CEO compensation. Core, Holthausen, and Larcker (1999) find larger boards are associated with higher levels of CEO compensation, suggesting less effective governance in the process of remunerating CEOs. Large boards are likely to be associated with poor communication and slow decision- making (Jensen, 1993). As a result, it is more likely for large boards to forgo the private signals about future performance when making compensation decisions, because the cost of reaching an agreement among board members can exceed the benefit of using the private information.

Third, it is widely believed that agency problems are more severe when the CEO is also the Chair of the Board (Yermack, 1996) because the function of the board chair potentially conflicts with his/her job as CEO (Jensen, 1993). Prior research finds that CEOs who are also the Chair of their boards receive higher compensation (Core et al., 1999; Cyert et al., 2002; Grinstein and Hribar, 2004). These findings may suggest that CEO Chairs are entrenched and use captive boards of directors to deal themselves large amounts of pay. Murphy (2002), however, points out that one plausible alternative explanation for the higher compensation observed is the CEO's enhanced bargaining position resulting from the value of her human capital. Therefore, the monitoring role of the board is arguably weakened when the CEO is also the Chair of the Board.

2.2.2.4 Information role of the board

The aforementioned board characteristics are also associated with the board's competence in its information role. First, as efficient as they are as monitors, independent

directors are disadvantaged in acquiring firm-specific information. They rely on communication with corporate executives for better knowledge. However, executives are reluctant to share information with boards that mainly consist of independent directors who act as tough monitors (Adams and Ferreira, 2007). As a result, boards that are more independent can have difficulty obtaining precise information about CEO actions.

Second, larger sized boards are associated with weaker information roles. Large boards, due to their poor communication with CEOs and among board members (Jensen, 1993), would be less capable of obtaining insightful information about the impact of CEO actions on future profitability. In addition, the presence of free-riding in large boards impedes the active acquisition of private information, since those who acquire the information bear the costs alone whereas the benefits are shared by the large board.

Third, the CEO/COB ('duality') arrangement facilitates the information role of the board because CEOs not only possess unparalleled specialized knowledge regarding the strategic challenges and opportunities facing the firm (Brickley et al., 1997) but they also have the best knowledge concerning the long-run impact of the decisions they make on the firm's value. This knowledge is essential to the chairman's job, too, especially in overseeing the process of evaluating and compensating the CEO. Since duality arrangements save the costs of incomplete transfers of critical information between the CEO and the chairman and improve the quality of private signals received by the board, they facilitate the efficient use of inside information in the compensation contract. Recent years have seen public companies with a majority of independent directors on their boards as a result of the Sarbanes Oxley Act, passed in 2002. In a board that consists more and more of outsiders, making the CEO the chair, rather than just a member, means

she could play a more proactive role in information sharing and it would be more likely for her voice to be heard by the whole board. In summary, since the CEO/COB arrangement could provide the board with higher quality information on CEO actions than the split arrangement, it would facilitate the use of private information in deciding CEO compensation.

Another board characteristic that might affect both the information and the monitoring roles of the board is the number of board meetings. There have been two opposing views on board meetings. One view is that boards meeting more frequently are more dedicated and do a better job of monitoring managers. An opposing view is that board meetings serve merely as fire-fighting devices rather than as proactive measures for good governance and that boards only meet more frequently in response to problems or poor performance (Jensen, 1993; Vafeas, 1999). I exclude this characteristic from the main analysis because it is not clear *ex ante* whether or not frequent meetings improve board efficiency[6].

2.2.2.5 Hypotheses

The reasoning above leads to the following hypotheses:

H1: The relation between future firm performance and current unexplained CEO compensation is stronger in firms with smaller boards.

As board independence (the CEO/COB arrangement) would strengthen (weaken) the monitoring role of the board while weaken (strengthen) the information role, it is an

[6] In an additional analysis (results untabulated), I include the number of board/committee meetings as an explanatory variable and find no statistically significant effects of the meeting variables on the use of private information in CEO compensation.

empirical question whether board independence (the CEO/COB arrangement) would facilitate or hinder the efficient use of private information.

H2a: The relation between future firm performance and current unexplained CEO compensation is stronger in firms with more independent boards.

H2b: The relation between future firm performance and current unexplained CEO compensation is weaker in firms with more independent boards.

H3a: The relation between future firm performance and current unexplained CEO compensation is stronger in firms with CEO as the Chair of the Board.

H3b: The relation between future firm performance and current unexplained CEO compensation is weaker in firms with CEO as the Chair of the Board.

Both the information role and the monitoring role of the board are important to achieve the efficient use of private information in compensation. As board independence and the CEO/COB arrangement each lends strength in one role and weakness in the other, a balanced design to capitalize on their strengths and avoid their weaknesses would enhance the efficient use of private information. For example, in a board dominated by independent directors, where strong monitoring is in place but information capability is low, it would be beneficial to have the CEO chair the board to balance the situation. In contrast, in a board that mainly consists of insiders, it would be more appropriate to separate the CEO from the Chair of the Board because acquiring information is no longer a problem but monitoring strength needs to be enhanced. Therefore, combining the measure of board independence and the measure of CEO/COB separation generates a

proxy for the balance (or imbalance) between the monitoring role and the information role.

H4: The relation between future firm performance and current unexplained CEO compensation is stronger in firms with balanced boards.

The compensation committee also plays an important role in the process of performance evaluation. In most companies, the board of directors use a compensation committee to review executive compensation programs, to evaluate the performances of executive officers, and to recommend CEO compensation to the board of directors for approval. Therefore, the attributes of the compensation committee are expected to impact the use of private information as well. The more competent the committee is in information acquisition and in monitoring, the more likely it will make compensation recommendations that incorporate private information about future firm performance.[7] Thus the attributes of the compensation committee are expected to impact the efficient use of private information in CEO compensation in the same way as those of the whole board.

2.3 Sample and research design

This paper adopts a modified version of Hayes and Schaefer's model (2000) to capture the use of private information in compensation contracts. First, I use current firm performance (observable to the public) to explain CEO compensation in the current period and extract the residual from the regression, which represents the component of

[7] It ultimately depends on the board of directors whether the final approved CEO compensation effectively incorporates privately observed signals.

CEO compensation that cannot be explained by current public performance measures. Second, I relate future firm performance to the unexplained CEO compensation while controlling for current firm performance. The relation obtained from the second stage serves as a proxy for the extent to which boards incorporate private information about future firm performance to compensate CEOs. If CEO compensation is to some extent contracted on privately observed performance measures that are correlated with future firm performance, a positive relation will be observed between future performance and current unexplained compensation.

For the purpose of studying whether CEO compensation uses private information, this two-stage procedure is equivalent to the single-step regression[8] in Hayes and Scheafer (2000). However, separating the unexplained CEO compensation using the two-stage procedure facilitates testing the impact of the board. It is relatively straightforward to add into the second-stage regression board characteristics variables and their interactions with the unexplained CEO compensation.

Consistent with Hayes and Schaefer (2000), the measure of CEO compensation includes cash pay (the sum of salary and bonus) only; current (year t) observable firm performance measures include return on common equity, stock market returns, sales, and lagged values of these variables; future firm performance is proxied by return on common equity in year t+1. I exclude stock-based compensation for the purpose of this study due to its characteristics. One component of stock-based compensation is from CEO's *holdings* of stocks and stock options; this component is entirely attributed to the

[8] Hayes and Schaefer (2000) estimate a single-step regression where future performance is regressed on current compensation, with controls for current observable performance measures. As a robustness check, I test my hypotheses using this single-step regression and obtain qualitatively the same results (unreported).

change of stock price and contains no private board information. The other component of stock-based compensation is *grants* of stocks and stock options, which are arguably performance-based. Core and Guay (1999) document that firms grant more equity to CEOs when their holdings are smaller, that is, options are granted to maintain an optimal level of incentive. It is also possible that equities are granted to substitute for cash compensation, as a reward for past performance. In that case, including these grants into analysis would only confound the results, because equity grants provide CEOs with incentives to improve firm performance in the future and thus make it hard to differentiate which of the two forces gives rise to the positive relation between current compensation and future performance: use of private information in compensation, or the incentive role played by these grants.[9]

In the first stage, changes in log cash pay are explained by contemporaneous changes and lagged changes in stock returns, log sales, and ROE. Specifically, I estimate the following regression model (firm-year subscript omitted):

$$\begin{aligned}\Delta \log COMP_t &= \alpha_0 + \alpha_1 \Delta RET_t + \alpha_2 \Delta ROE_t + \alpha_3 \Delta \log SALES_t \\ &+ \alpha_4 \Delta RET_{t-1} + \alpha_5 \Delta ROE_{t-1} + \alpha_6 \Delta \log SALES_{t-1} \\ &+ \alpha_7 \Delta RET_{t-2} + \alpha_8 \Delta RET_{t-3} + \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon\end{aligned} \quad (1),$$

where COMP is the sum of salary and bonus awarded to the CEO, ROE represents return on common equity, RET is annual stock return, and SALES represents sales revenue. Fixed effects for year and two-digit industry are included (*IndustyDum* and *YearDum*). Except for the year and the industry indicators, all variables are change measures.

[9] While excluding stock compensation from the main analysis, I recognize that potential substitution of equity incentives for cash pay can confound my findings. To address this issue, further robustness check is conducted. Section 4.6 provides detailed discussion on this matter.

There are potentially more factors that could affect CEO compensation than the public performance measures listed above. The change specification is adopted to implicitly control for the impact of other firm characteristics, such as firm size, risk, and growth opportunities, which are either time-invariant or change relatively slowly over time.

Note that the purpose of estimating the first-stage regression is to obtain a residual compensation that is orthogonal to current public performance measures. Therefore, it does not have to be a complete model that captures all characteristics of compensation contracts. For example, the fact that the first-stage regression does not control for potential asymmetry in pay-to-gains and pay-to-losses sensitivities would not bias the residual as it is orthogonal to public performance measures under the current specification. In addition, as long as the omitted characteristics in the first stage are not correlated with future firm performance, the results from the second stage would be affected only to the extent that power would be reduced (i.e., it biases toward the null hypothesis).[10]

In stage two, changes in future ROE is regressed on the residuals from regression (1) and controls for changes in current public performance measures[11]:

$$\begin{aligned}\Delta ROE_{t+1} &= \alpha_0 + \alpha_1 UCOMP_t + \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t \\ &+ \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1} \\ &+ \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon\end{aligned} \quad (2),$$

[10] In additional analyses (results untabulated), I expand the first-stage regression by allowing the weights on performance measures to vary with noises of performance measures and growth opportunities. The results of the second-stage regression and the impact of the board remain qualitatively the same.

[11] An alternative way to specify the second-stage regression is to regress residual compensation on future performance while controlling for current performance measures. Although both specifications can capture the correlation between current compensation and future performance, the specification I adopt here is preferable because it makes better sense to predict the future based on what we know in the current period.

where UCOMP is the residual from the first stage regression, i.e. the portion of CEO compensation that cannot be explained by currently observable performance measures.

The coefficient on UCOMP estimated from regression (2) thus captures the extent to which boards of directors incorporate their private information to compensate CEOs. To examine the impact of corporate boards and compensation committees, I allow UCOMP to interact with the board/committee characteristics variables [12].

$$\Delta ROE_{t+1} = \alpha_0 + UCOMP_t \times (\alpha_1 + \sum \beta_i attribute_i) + \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t + \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1} + \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \sum \gamma_i attribute_i + \sum \delta_j IndustyDum_j + \sum \lambda_k YearDum_k + \varepsilon \quad (3),$$

Several dimensions of board/committee characteristics ($attribute_i$) are considered, including the size of the board (*BSIZE*) and that of the compensation committee (*CSIZE*), the independence of the board (*BPCT*) and that of the committee (*CPCT*), and whether the CEO is Chair of the Board (*SEPCHR*).

The sample consists of 3,460 firm-years for 1,542 publicly traded U.S. firms from year 1997 to 2003. CEO compensation, financial performance, and stock returns data come from EXECUCOMP, COMPUSTAT, and CRSP, respectively. As the regression model requires a change measure of compensation and lagged values of the firm performance variables, a firm-year within 1997-2003 is included in the sample only if the CEO tenure is three years or more and if COMPUSTAT and CRSP data are available for the current year, the subsequent year, and the two prior years. There are 4,961 firm-year observations that meet these requirements. This sample is then merged with IRRC data, resulting in

[12] I employ several model specifications to mitigate the multi-collinearity problem. Section 4 provides detailed discussion on these specifications.

3,778 observations with non-missing board/committee characteristics variables. To be consistent with Hayes and Schaefer (2000), 318 observations with absolute values of ROE change greater than 0.5 are dropped out to reduce the effect of outliers[13].

Table 2.1 presents the summary statistics. Changes in compensation and firm performance variables are reported as well as levels. The sample distribution is similar to that of Hayes and Schaefer (2000)[14]. Table 2.1 also summarizes the sample distribution of all the board characteristics variables. It shows that all model variables display a fair amount of variation across sample firms.

2.4 Results

2.4.1 Private information in compensation contracts

The private information of the board is captured by a two-stage procedure. Table 2.2 reports the results from these two regressions. In the second stage, the coefficient estimate on the unexpected compensation is positive (0.0166) and significant at the 1% level, indicating that the variation in current compensation unexplained by current public performance measures contains information about future performance. The results are consistent with those of Hayes and Schaefer (2000). In general, boards of directors make use of their private information about future performance to compensate CEOs.

[13] If the change in ROE is too large, it is likely that the company has gone through significant changes, e.g., merger and acquisition. These events make firm performance less comparable across time. The results of this paper are unaffected if observations are trimmed based on 1% and 99% of ROE change.

[14] Not surprisingly, the level of CEO compensation is higher compared to a decade ago. The mean $\log COMP$ is 6.39, higher than that reported by Hayes and Schaefer (2000), which is 6.29. Firm performance, as measured by ROE and the annual stock return, is around the same level as before. The mean *RET* is 0.11 and mean *ROE* is 0.12 (0.13, and 0.14 respectively in Hayes and Schaefer (2000)). The mean changes in $\log COMP$, *RET* and *ROE* are 0.05, -0.006, and -0.004, respectively (0.047, -0.016, and -0.003 in HS2000).

2.4.2 Impact of board characteristics

To examine the impact of board attributes on the extent to which private information is used to decide CEO compensation, one can add into the second-stage regression interactions of board/committee variables with the variable for unexpected compensation (UCOMP). However, including all the board/committee variables would cause severe multi-collinearity, as shown in Table 2.3. The correlations among these interaction terms are extremely high (with correlation coefficients up to 0.98), suggesting that the model should be specified in other ways than including all interaction terms. The following three approaches help to mitigate this problem:

First, I use factor analysis[15] to reduce the number of variables. Specifically, the estimation method of Principal Component Analysis is employed. The inputs for the analysis are five variables on board and compensation committee attributes. The structure of these variables is well laid out as they measure board/committee attributes in three dimensions: size, independence, and the dual arrangement of CEO/COB. These three factors can explain most of their variance. The eigenvalue basically justifies the adoption of three factors. As shown in Table 2.4, the factor structure clearly supports my conjecture: *BPCT* and *CPCT* load highly on one common factor (*Factor1*); *BSIZE* and *CSIZE* load on a second common factor (*Factor2*); *SEPCHR* loads on the third common factor (*Factor3*).

The results from factor analysis suggest that the board level and the committee level variables in the same dimension can be combined. Table 2.5 Panel A reports the results

[15] "The purpose of factor analysis is to discover simple patterns in the pattern of relationships among the variables. In particular, it seeks to discover if the observed variables can be explained largely or entirely in terms of a much smaller number of variables called *factors*" (Darlington, 2005).

of the regression, where the combined average measures (e.g., the average value of board size and committee size, and the average value of board independence and committee independence) are interacted with the unexplained CEO compensation. It shows that independence of the board/committee (PCT) has a significantly positive impact on the relation between future performance and current unexplained compensation, supporting the view that board monitoring facilitates the efficient use of private information in compensation contracts. The coefficient on $UCOMP_t \times SEPCHR$ is negative and significant at the 1% level, suggesting that private information about future performance is used more heavily in firms with CEO-chairs because boards in these firms have better knowledge about their managers' work. As predicted, the interaction of board/committee size ($SIZE$) with $UCOMP_t$ has a negative coefficient estimate, which indicates that large boards are inefficient in obtaining and exploiting private information.

To further reduce the correlation among explanatory variables, I rank all the board/committee variables except for the duality indicator. The percentile variables for the board and for the committee in the same dimension are then averaged and interacted with UCOMP. The results, as reported in the second column of Table 2.5, confirm the estimates from the regression using average values.

As a robustness check, I estimate a third regression where the factors generated from the Principal Component Analysis interact with $UCOMP_t$, and the results (not reported for brevity) are qualitatively the same as those reported.

Next, to reduce the number of variables I retain only the compensation committee variables and the CEO/COB[16] indicator in the regression model. The committee is often delegated to be responsible for the process of compensating executives thus the composition of the committee is expected to have a direct impact on CEO compensation.

The results are reported in Table 2.5 Panel B. Consistent with Panel A, size of the committee appears to have a negative effect whereas the percentage of independent directors in the committee has a positive effect on the use of private information. The coefficient on the indicator variable of CEO/COB separation is consistently negative and significant at the 1% level. The results show that the composition of the compensation committee, as well as that of the whole board, has a significant impact on compensation efficiency with respect to the use of private information.

As discussed before, both the information role and the monitoring role of the board are important in the efficient use of private information in compensation. A measure of imbalance between the two roles is constructed based on the following two variables: the percentage of independent directors on the board/committee, and the indicator variable of CEO/COB separation (1 if separate and 0 if otherwise). Large value of either variable suggests high monitoring strength and low information capability. An unbalanced board with extremely strong (weak) monitoring role but rather weak (strong) information role would exhibit large (small) values in both variables. Therefore, the measure of imbalance is constructed as the absolute difference between the average of the two variables and the sample median of the average. The larger is this measure, the more likely that one of the

[16] The exact counterpart for the CEO/COB arrangement in the compensation committee would be CEO being chair of the committee. However, such arrangement is rarely observed in the sample firms.

roles is compromised. The measure of imbalance is then interacted with the unexplained component of CEO compensation.

Examination of the measure of imbalance is reported in Table 2.5 Panel C. As predicted, the interaction of the imbalance measure and the unexplained compensation ($UCOMP_t \times Imbalance$) carries a negative coefficient estimate, significant at the 1% level. This evidence supports the hypothesis that boards with a balanced structure, where neither role is compromised, would be more efficient in exploiting private information than those with strong monitoring but poor information or those with access to precise information but weak governance.

2.4.3 Impact of the board/committee in firms with noisy public performance measures

Agency theory predicts that in optimal contracts the weight on one performance measure is positively associated with its own precision and also with the noisiness of alternative performance measures. Hayes and Schaefer (2000) find that the board will have to rely more heavily on private information to compensate the CEO when public performance measures are noisy. To rule out the possibility that the impact of the board documented in this paper results from the correlation between board characteristics and the quality of public performance measures, I further control for public performance volatility—the volatility of ROE and that of stock returns [17] —in the second-stage regression and allow the volatility measures to interact with unexplained CEO compensation ($UCOMP$). The results (not reported for brevity) of the hypotheses tests remain the same, suggesting that given the need for private performance measures,

[17] The volatility of a firm's ROE (stock returns) is measured as the variance of a firm's ROE (annual stock return) in previous 5 years.

boards of directors (and compensation committees) have an incremental impact on whether private information about CEO actions could be obtained and efficiently used.

The next set of tests focuses on firms with noisy public performance measures, that is, firms with volatility of ROE and volatility of stock returns both above the sample median. Presumably these firms have a stronger need to use private performance measures to improve compensation efficiency. Whether this need could be satisfied depends on the competence of the board (and the compensation committee). Therefore, examining the role of the board in this sub-sample provides more conclusive evidence on board efficiency. The results are reported in Table 2.6. Consistent with the full-sample results, the effect of size and CEO/COB separation is negative on the relation between future performance and current unexplained compensation, significant at the 5% level or lower. Furthermore, the magnitude of the effect is larger compared to the full-sample results (e.g., the coefficient estimate on $UCOMP_t \times SEPCHR$ range from -0.06 to -0.07 for this subgroup compared to -0.04 or so in Table 2.5). The effect of board/committee independence, however, is found to be less significant in this sub-sample. The coefficient estimate is only marginally significant in the rank regression (Model 2 in Panel A) and insignificant elsewhere. Nevertheless, the imbalance measure still carries a significantly negative coefficient estimate, as presented in Panel C. Put together, this evidence suggests that the relative importance of obtaining information is higher in volatile firms than in average firms, but it is still favorable that the board strikes a balance between its monitoring role and information role.

2.4.4 Test of asymmetry in reward and punishment

In this paper, the association between future firm performance and current unexplained compensation serves as a measure of boards' use of private information to improve compensation efficiency. An underlying assumption is that boards use private information in symmetric ways both to reward and to punish CEOs; therefore a stronger association between pay and future performance indicates higher compensation efficiency. However, it is possible that boards reward CEOs for good future prospects but do not punish them for bad ones. When reward and punishment are asymmetric, we could still observe a positive association between future ROE and current compensation if the sensitivity of pay to good news is sufficiently high to mask the lack of sensitivity to bad news. This raises concern about the implication of findings on certain board characteristics, such as the dual arrangement of CEO and COB—the stronger association between future performance and current compensation in firms with CEO as board chair could reflect stronger asymmetry in reward and punishment rather than more efficient compensation.

On the other hand, it is debatable that the board would use asymmetry in reward and punishment to fashion a positive association between future performance and current compensation, because such association is unobservable and hence not under the scrutiny of outside investors whereas it imposes additional risks to CEOs.

I estimate the following regressions to test the existence of asymmetry in rewarding and punishing CEOs based on private information. First, I regress current CEO compensation on current public performance measures and retain the residual ε_{comp}, which represents the portion of CEO compensation potentially based on private

information that the board has; second, I regress future firm performance on current firm performance and retain the residual ε_{froe}, which captures the component of future performance that cannot be foreseen by the public (but can be known by the board); finally, I regress ε_{comp} on ε_{froe} conditional on the sign of ε_{froe} to examine the asymmetry in reward and punishment.

The results, as reported in Table 2.7, show no significant difference in the sensitivities of residual compensation to positive future performance surprises versus negative future performance surprises. The coefficient on the interaction of ε_{froe} and the negative ε_{froe} indicator is not significantly different from zero. I also estimate the same regressions specifically for the sub-group of firms with CEO as the board chair. Consistent with the full-sample results, no asymmetry in reward and punishment is found in these firms.

2.4.5 Substitution effect of stock and stock option grants

This paper finds that the relation between current cash compensation and future firm performance varies across firms and that board characteristics help to explain this cross-sectional variation. Another factor that could also account for this variation is the substitution of equity incentives for cash pay. In firms that substitute equity incentives for cash pay, a year with low cash pay will tend to be accompanied by a larger number of stock and stock option grants, which motivate CEOs to exert more effort and enhance firm value in future periods. As a result, a weak or even negative correlation between current cash pay and future performance can be observed in the substitution firms. If these firms happen to have larger and less independent boards with CEO separate from COB, my findings on the impact of board characteristics would be spurious.

To remove the confounding effect of stock compensation, I add the contemporaneous change in grants of stock and stock options into the first-stage regression (where current cash pay is regressed on current public performance measures) to capture the potential substitution of grants for cash pay. The residual term from this modified first-stage regression is thus orthogonal to stock and option grants, and hence its relation to future performance is free from the confounding effect of stock compensation. Using this residual term in the second-stage regression generates qualitatively the same results as reported. That is, the effect of board characteristics is robust to controlling the substitution effect of stock and option grants.

2.4.6 Alternative explanation: earnings management

Compensation contracts based on firm performance could induce managers' opportunism in financial reporting (Healy 1985; Cheng and Warfield, 2005). The findings of this paper could partly be attributable to earnings management if CEOs have the incentive to manage future earnings upward to secure a large bonus in the current period. However, it is unlikely to be the case.

First of all, the earnings management story does not apply basically because CEO compensation is independent from realized future performance. What enters into the compensation contract is the private information of the board with respect to future firm performance, i.e., it is the ex ante expectation, not the ex post realization of future performance, that drives CEO compensation. Therefore, no obvious incentives exist for the CEO to manage future earnings.

Second, I find no evidence that managers try to influence the way boards of directors form expectations through earnings management. The argument is that CEOs manage

future earnings upward to justify the high pay they received so that the board would keep following their guidance when it makes the next compensation decision. If this is the case, CEOs would manage earnings upward to prove the board right when the discretionary bonus was high and again manage earnings upward to prove the board wrong when the discretionary bonus was low in the last period. As a result, the positive relation between future performance and current unexplained compensation would be stronger when the unexplained compensation is positive; whereas it would become rather weak when the unexplained compensation is negative. Untabulated results show that this is not the case.

Starting with the residuals of the first stage regression, where current compensation is explained by current observable performance measures, I divide the sample into two groups: one with positive residual compensation (i.e., CEOs receive extra bonuses) and the other with negative residual compensation (i.e., CEOs lose extra bonuses). I then run the second stage regression for each group. It is found that the relation between future performance and current unexplained compensation is almost the same for the two groups, and even slightly stronger in the group with negative residual compensation. The findings render no support for the argument that managers try to justify their high compensation through earnings management.

2.5 Conclusion

This paper reveals an important way through which boards can affect compensation efficiency. That is, efficient boards use their private information to reward or punish CEOs for actions that are not observable to outsiders, whereas inefficient boards fail to do so.

I use a two-stage procedure is adopted to capture the private information contained in CEO compensation. The first stage regresses current CEO compensation on currently observable performance measures. The second stage regresses future performance on the residuals of CEO compensation from the first-stage regression, i.e., the component of current compensation that cannot be explained by current performance measures. The coefficient on unexplained CEO compensation interacted with variables of board characteristics indicates the impact of the board on the efficient use of private information.

Several model specifications test specific attributes of the board and that of the compensation committee. With a sample of 3,460 firm-years over the period of 1997-2003, I find that the unexplained CEO compensation is more strongly associated with future performance in firms that have smaller and more independent boards and in firms that have CEOs as the board chair. In addition, a balanced board structure that accommodates both the monitoring role and the information role enhances the board's efficiency in exploiting private information. The findings are robust to a variety of alternative specifications, and to controls for the noise in the public performance measures and potential substitution of equity incentives for cash pay. There is no evidence that boards use private information in an asymmetric way to reward and punish CEOs.

One caveat of this paper is that both compensation contract and board structure are endogenous. To the extent that the empirical model has left out some economic characteristics that drive the change in CEO compensation as well as the board structure, the relation found in this paper might be a spurious one. The empirical specification of

this paper addresses this concern and partly alleviates the endogeneity problem. The volatility of the firm performance, which could affect executive compensation and at the same time correlate with board structures, is controlled for in two different ways: one is to add volatility as a control variable into the regression; the other is to run regressions separately for firms that are more volatile and for firms who are less. The relation previously found between board characteristics and the use of private information is robust to these alternate specifications, which render support to the hypothesis that the role of the board matters in using private performance measures. To fully address the endogeneity issue, however, future research could utilize a setting where change in board structures is exogenous (e.g. mandatory) and study the change in executive compensation that follows.

The paper adds to the literature new evidence on how boards affect compensation efficiency through the use of private performance measures. Compared to prior research on board efficiency, the underlying assumption this paper relies on is relatively weak. Boards of directors probably have public relation concerns when they set the sensitivities of CEO pay to public performance measures; however, they don't have such incentives when they use private (in addition to public) information to compensate CEOs, so efficient use of private information is the most likely explanation. Distinct from prior research that focuses only on public performance measures in CEO compensation, this paper predicts and finds that the board needs to be competent in information acquisition as well as in monitoring to achieve efficiency. A balanced board is found to be the most favorable.

Table 2.1 Summary statistics

Variable	Nobs	Mean	Std. dev.	Q1	Median	Q3
Compensation and performance measures						
$\log COMP_t$	6,366	6.398	0.954	5.921	6.411	6.891
RET_t	6,366	0.112	0.309	-0.061	0.072	0.226
ROE_t	6,366	0.119	0.129	0.073	0.126	0.178
$\log SALES_t$	6,366	6.762	1.500	5.734	6.681	7.735
$\Delta \log COMP_t$	6,366	0.050	0.330	-0.064	0.045	0.195
ΔRET_t	6,366	-0.006	0.403	-0.204	-0.003	0.207
ΔROE_t	6,366	-0.004	0.103	-0.039	-0.001	0.031
$\Delta \log SALES_t$	6,366	0.082	0.187	-0.007	0.064	0.159
Board characteristics						
BSIZE	3,460	9.74	2.85	8.00	9.00	11.00
CSIZE	3,460	3.65	1.16	3.00	3.00	4.00
BPCT	3,460	65.01	17.38	55.56	66.70	78.59
CPCT	3,460	89.65	19.68	80.00	100.00	100.00
SEPCHR	3,460	0.21	0.41	0.00	0.00	0.00

Notes: COMP is the sum of salary and bonus awarded to CEO; ROE represents firm's return on common equity; RET stands for firm's annual market return, and SALES represents firm's sales. *BSIZE* is the size of board, *CSIZE* is the size of compensation committee, *BPCT* is the percentage of independent directors in the board, *CPCT* is the percentage of independent directors in the compensation committee, and *SEPCHR* is an dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise.

Table 2.2 Estimates of earnings-relevant information contained in executive compensation

Panel A. Predict changes in CEO compensation with currently observable performance measures

$$\Delta \log COMP_t = \alpha_0 + \alpha_1 \Delta RET_t + \alpha_2 \Delta ROE_t + \alpha_3 \Delta \log SALES_t + \alpha_4 \Delta RET_{t-1} + \alpha_5 \Delta ROE_{t-1} + \alpha_6 \Delta \log SALES_{t-1} + \alpha_7 \Delta RET_{t-2} + \alpha_8 \Delta RET_{t-3} + \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon \quad (1),$$

	Predicted Sign	Coef.	t-stat
Intercept		0.0308	0.43
ΔRET_t	+	0.2687***	16.51
ΔROE_t	+	0.6581***	11.61
$\Delta \log SALES_t$	+	0.3568***	12.21
ΔRET_{t-1}	+	0.1625***	8.24
ΔROE_{t-1}	+	0.0334	0.61
$\Delta \log SALES_{t-1}$	+	-0.1420***	-5.00
ΔRET_{t-2}	+	0.0455**	2.48
ΔRET_{t-3}	+	-0.0009	-0.06
N		3,402	
Adj R-sq		0.2448	

Panel B. Relate changes in future ROE to the residuals from regression (1)

$$\Delta ROE_{t+1} = \alpha_0 + \alpha_1 UCOMP_t + \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t + \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1} + \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon \quad (2),$$

	Predicted Sign	Coef.	t-stat
Intercept		0.0341*	1.75
$UCOMP_t$	+	0.0166***	3.44
ΔRET_t	+	0.0686***	15.09
ΔROE_t	-	-0.4093***	-25.23
$\Delta \log SALES_t$	+	0.0108	1.32
ΔRET_{t-1}		0.0426***	7.80
ΔROE_{t-1}		-0.2197***	-14.17
$\Delta \log SALES_{t-1}$		-0.0521***	-6.57
ΔRET_{t-2}		0.0179***	3.51
ΔRET_{t-3}		-0.0042	-1.03
N		3,324	
Adj R-sq		0.2675	

Note: COMP is the sum of salary and bonus awarded to CEO, ROE represents firm's return on common equity, RET stands for firm's annual market return, and SALES represents firm's sales. Except for *IndustyDum* and *YearDum*, all variables are change measures. The subscripts t+1, t, t-1, t-2, and t-3 represent the subsequent year, the current year, and the three prior years, respectively. For example, ΔROE_{t+1}, ΔROE_t and ΔROE_{t-1} are the changes of firm's return on equity in the subsequent year, current year, and prior year. Fixed effects for year and two-digit industry are included (*IndustyDum* and *YearDum*). UCOMP is the residual from the first stage regression, representing the portion of CEO compensation that cannot be explained by currently observable performance measures.

*, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1% (one-tailed where prediction is uni-directional).

Table 2.3 Correlation among the unexpected change in CEO compensation and its interactions with board/committee characteristics variables

	$UCOMP_t$	$UCOMP_t \times BSIZE$	$UCOMP_t \times BPCT$	$UCOMP_t \times SEPCHR$	$UCOMP_t \times CSIZE$	$UCOMP_t \times CPCT$
$UCOMP_t$	1					
$UCOMP_t \times BSIZE$	0.9602***	1				
$UCOMP_t \times BPCT$	0.9669***	0.9318***	1			
$UCOMP_t \times SEPCHR$	0.4525***	0.4257***	0.4304***	1		
$UCOMP_t \times CSIZE$	0.9514***	0.9539***	0.9404***	0.4261***	1	
$UCOMP_t \times CPCT$	0.9763***	0.9386***	0.9754***	0.4336***	0.9301***	1

Note: COMP is the sum of salary and bonus awarded to CEO. UCOMP is the residual from regression (1), representing the portion of CEO compensation that cannot be explained by currently observable performance measures. *BSIZE* is the size of board, *CSIZE* is the size of compensation committee, *BPCT* is the percentage of independent directors in the board, *CPCT* is the percentage of independent directors in the compensation committee, and *SEPCHR* is an dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise.

*, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1%.

Table 2.4 Factor analysis of the board/committee characteristic variables

Panel A: Factor Structure out of Principal Component Analysis (Number of Factors = 3)

	$Factor_1$	$Factor_2$	$Factor_3$
BPCT	0.8756	0.1651	-0.0568
CPCT	0.8940	-0.0318	-0.0147
BSIZE	0.0070	0.8504	-0.0297
CSIZE	0.1145	0.8559	-0.0183
SEPCHR	-0.0507	-0.0352	0.9980

Panel B: Justification of Three Factors

	Eigenvalue	Difference	Proportion	Cumulative
1	1.7865	0.4801	0.3573	0.3573
2	1.3065	0.3322	0.2613	0.6186
3	0.9743	0.3909	0.1949	0.8135
4	0.5834	0.2340	0.1167	0.9301
5	0.3494		0.0699	1

Note: This table shows the results of an analysis of common factors for the five board characteristic variables. *BSIZE* is the size of board, *CSIZE* is the size of compensation committee, *BPCT* is the percentage of independent directors in the board, *CPCT* is the percentage of independent directors in the compensation committee, *SEPCHR* is a dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise..

Table 2.5 Impact of board characteristics

Panel A. Association of the Combined Board Characteristics with the Earnings-Relevant Information Contained in Executive Compensation

$$\Delta ROE_{t+1} = \alpha_0 + UCOMP_t \times (\alpha_1 + \beta_1 SIZE_t + \beta_2 PCT_t + \beta_3 SEPCHR_t)$$
$$+ \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t + \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1}$$
$$+ \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \delta_1 SIZE_t + \delta_2 PCT_t + \delta_3 SEPCHR_t$$
$$+ \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon$$

		Model 1		Model 2 (rank)	
	Predicted Sign	Coef.	t-stat	Coef.	t-stat
Intercept		0.0237	1.08	0.0341*	1.68
$UCOMP_t$	+	0.0026	0.09	0.0182	1.21
$UCOMP_t \times SIZE$	-	-0.0049**	-1.76	-0.0414**	-2.07
$UCOMP_t \times PCT$	+/-	0.0007**	2.41	0.0552**	2.54
$UCOMP_t \times SEPCHR$	+/-	-0.0426***	-3.52	-0.0417***	-3.44
ΔRET_t		0.0688***	15.04	0.0694***	15.16
ΔROE_t		-0.4154***	-25.45	-0.4107***	-25.24
$\Delta \log SALES_t$		0.0092	1.11	0.0094	1.15
ΔRET_{t-1}		0.0428***	7.81	0.0428***	7.81
ΔROE_{t-1}		-0.2175***	-14.00	-0.2190***	-14.09
$\Delta \log SALES_{t-1}$		-0.0506***	-6.36	-0.0506***	-6.34
ΔRET_{t-2}		0.0183***	3.58	0.0183***	3.58
ΔRET_{t-3}		-0.0043	-1.06	-0.0053	-1.30
SIZE		0.0010	1.10	0.0041	0.62
PCT		0.0001	0.55	-0.0005	-0.07
SEPCHR		0.0042	1.14	0.0042	1.14
N		3,327		3,327	
Adj R-sq		0.2727		0.2722	

Note: In Model 1 (Model 2), *SIZE* is the average value (percentile) of board size and compensation committee size, *PCT* is the average value (percentile) of independent directors' percentage in the board and that in the committee; *SEPCHR* is a dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise.

*, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1% (one-tailed where prediction is uni-directional).

Panel B. Association of the Compensation Committee Characteristics with the Earnings-Relevant Information Contained in Executive Compensation

$$\Delta ROE_{t+1} = \alpha_0 + UCOMP_t \times (\alpha_1 + \beta_1 CSIZE_t + \beta_2 CPCT_t + \beta_3 SEPCHR_t)$$
$$+ \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t + \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1}$$
$$+ \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \delta_1 CSIZE_t + \delta_2 CPCT_t + \delta_3 SEPCHR_t$$
$$+ \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon$$

	Predicted Sign	Coef.	t-stat
Intercept		0.0289	1.34
$UCOMP_t$	+	0.0047	0.17
$UCOMP_t \times CSIZE$	-	-0.0094**	-2.26
$UCOMP_t \times CPCT$	+/-	0.0006**	2.45
$UCOMP_t \times SEPCHR$	+/-	-0.0439***	-3.63
ΔRET_t		0.0698***	15.28
ΔROE_t		-0.4162***	-25.53
$\Delta \log SALES_t$		0.0106	1.29
ΔRET_{t-1}		0.0435***	7.92
ΔROE_{t-1}		-0.2191***	-14.10
$\Delta \log SALES_{t-1}$		-0.0515***	-6.46
ΔRET_{t-2}		0.0185***	3.62
ΔRET_{t-3}		-0.0045	-1.12
$CSIZE$		0.0001	0.09
$CPCT$		0.0001	0.86
$SEPCHR$		0.0040	1.10
N		3,327	
Adj R-sq		0.2752	

Note: $CSIZE$ is the size of compensation committee, $CPCT$ is the percentage of independent directors in the compensation committee, and $SEPCHR$ is a dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise.

*, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1% (one-tailed where prediction is uni-directional).

Panel C. Impact of the balanced role of the board on the relation between future performance and current unexplained compensation

$$\Delta ROE_{t+1} = \alpha_0 + UCOMP_t \times (\alpha_1 + \beta_1 SIZE_t + \beta_2 Imbalance_t)$$
$$+ \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t + \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1}$$
$$+ \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \delta_1 SIZE_t + \delta_2 Imbalance_t + \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon$$

		Model 1		Model 2 (rank)	
	Predicted Sign	Coef.	t-stat	Coef.	t-stat
Intercept		0.0271	1.30	0.0311	1.55
$UCOMP_t$	+	0.0603***	3.08	0.0530***	4.34
$UCOMP_t \times SIZE$	-	-0.0042*	-1.51	-0.0347**	-1.74
$UCOMP_t \times Imbalance$	-	-0.1163***	-4.13	-0.1197***	-3.96
ΔRET_t		0.0696***	15.16	0.0695***	15.11
ΔROE_t		-0.4117***	-25.22	-0.4066***	-24.93
$\Delta \log SALES_t$		0.0093	1.12	0.0095	1.15
ΔRET_{t-1}		0.0429***	7.80	0.0425***	7.70
ΔROE_{t-1}		-0.2161***	-13.87	-0.2131***	-13.67
$\Delta \log SALES_{t-1}$		-0.0510***	-6.39	-0.0517***	-6.45
ΔRET_{t-2}		0.0188***	3.66	0.0183***	3.55
ΔRET_{t-3}		-0.0039	-0.96	-0.0042	-1.02
SIZE		0.0010	1.04	0.0047	0.71
Imbalance		0.0115	1.34	0.0143	1.53
N		3329		3329	
Adj R-sq		0.2707		0.2679	

Note: In Model 1 (Model 2), *SIZE* is the average value (percentile) of board size and compensation committee size, *Imbalance* is the absolute difference between the average of *PCT* and *SEPCHR* and the sample median of the average. *PCT* is the average value (percentile) of independent directors' percentage in the board and that in the committee; *SEPCHR* is a dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise.

*, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1% (one-tailed where prediction is uni-directional).

Table 2.6 Results of regressions within the sub-sample with noisy public performance measures

Panel A. Association of the Combined Board Characteristics with the Earnings-Relevant Information Contained in Executive Compensation

$$\Delta ROE_{t+1} = \alpha_0 + UCOMP_t \times (\alpha_1 + \beta_1 SIZE_t + \beta_2 PCT_t + \beta_3 SEPCHR_t)$$
$$+ \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t + \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1}$$
$$+ \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \delta_1 SIZE_t + \delta_2 PCT_t + \delta_3 SEPCHR_t$$
$$+ \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon$$

		Model 1		Model 2 (rank)	
	Predicted Sign	Coef.	t-stat	Coef.	t-stat
Intercept		-0.0754	-1.30	-0.0425	-0.79
$UCOMP_t$	+	0.0441	0.61	0.0462	1.23
$UCOMP_t \times SIZE$	-	-0.0150**	-2.01	-0.1092**	-2.31
$UCOMP_t \times PCT$	+/-	0.0011	1.59	0.0917*	1.80
$UCOMP_t \times SEPCHR$	+/-	-0.0687***	-2.63	-0.0689***	-2.64
ΔRET_t		0.0776***	8.67	0.0777***	8.66
ΔROE_t		-0.4362***	-14.06	-0.4329***	-13.94
$\Delta \log SALES_t$		-0.0228	-1.22	-0.0216	-1.16
ΔRET_{t-1}		0.0595***	5.68	0.0592***	5.65
ΔROE_{t-1}		-0.2488***	-8.46	-0.2480***	-8.43
$\Delta \log SALES_{t-1}$		-0.0714***	-4.04	-0.0710***	-4.01
ΔRET_{t-2}		0.0220**	2.31	0.0216**	2.27
ΔRET_{t-3}		-0.0048	-0.62	-0.0051	-0.66
$SIZE$		0.0017	0.61	0.0138	0.78
PCT		0.0006**	2.57	0.0342**	1.97
$SEPCHR$		0.0056	0.60	0.0049	0.52
N		1,014		1,014	
Adj R-sq		0.3285		0.3279	

Note: the sample firms are those with variance of ROE and variance of RET both above the sample median. In Model 1 (Model 2), $SIZE$ is the average value (percentile) of board size and compensation committee size, PCT is the average value (percentile) of independent directors' percentage in the board and that in the committee; $SEPCHR$ is a dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise. *, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1% (one-tailed where prediction is uni-directional).

Panel B. Association of the Compensation Committee Characteristics with the Earnings-Relevant Information Contained in Executive Compensation

$$\Delta ROE_{t+1} = \alpha_0 + UCOMP_t \times (\alpha_1 + \beta_1 CSIZE_t + \beta_2 CPCT_t + \beta_3 SEPCHR_t)$$
$$+ \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t + \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1}$$
$$+ \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \delta_1 CSIZE_t + \delta_2 CPCT_t + \delta_3 SEPCHR_t$$
$$+ \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon$$

	Predicted Sign	Coef.	t-stat
Intercept		-0.0500	-0.91
$UCOMP_t$	+	0.0791*	1.78
$UCOMP_t \times CSIZE$	-	-0.0213**	-2.04
$UCOMP_t \times CPCT$	+/-	0.0385	1.51
$UCOMP_t \times SEPCHR$	+/-	-0.0642**	-2.46
ΔRET_t		0.0781***	8.72
ΔROE_t		-0.4329***	-13.98
$\Delta \log SALES_t$		-0.0202	-1.08
ΔRET_{t-1}		0.0595***	5.67
ΔROE_{t-1}		-0.2497***	-8.46
$\Delta \log SALES_{t-1}$		-0.0687***	-3.89
ΔRET_{t-2}		0.0223**	2.32
ΔRET_{t-3}		-0.0045	-0.59
$CSIZE$		0.0049	1.25
$CPCT$		0.0173**	2.02
$SEPCHR$		0.0051	0.54
N		1,014	
Adj R-sq		0.3274	

Note: the sample firms are those with variance of ROE and variance of RET both above the sample median. $CSIZE$ is the size of compensation committee, $CPCT$ is the percentage of independent directors in the compensation committee, and $SEPCHR$ is a dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise.

*, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1% (one-tailed where prediction is uni-directional).

Panel C. Impact of the balanced role of the board on the relation between future performance and current unexplained compensation

$$\Delta ROE_{t+1} = \alpha_0 + UCOMP_t \times (\alpha_1 + \beta_1 SIZE_t + \beta_2 Imbalance)$$
$$+ \alpha_2 \Delta RET_t + \alpha_3 \Delta ROE_t + \alpha_4 \Delta \log SALES_t + \alpha_5 \Delta RET_{t-1} + \alpha_6 \Delta ROE_{t-1} + \alpha_7 \Delta \log SALES_{t-1}$$
$$+ \alpha_8 \Delta RET_{t-2} + \alpha_9 \Delta RET_{t-3} + \delta_1 SIZE_t + \delta_2 Imbalance_t + \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon$$

		Model 1		Model 2 (rank)	
	Predicted Sign	Coef.	t-stat	Coef.	t-stat
Intercept		-0.0260	-0.48	-0.0226	-0.43
$UCOMP_t$	+	0.1471***	3.05	0.1090***	3.79
$UCOMP_t \times SIZE$	-	-0.0165**	-2.21	-0.1160***	-2.48
$UCOMP_t \times Imbalance$	-	-0.1259**	-2.12	-0.1320**	-2.10
ΔRET_t		0.0788***	8.82	0.0823***	9.21
ΔROE_t		-0.4425***	-14.26	-0.4391***	-14.23
$\Delta \log SALES_t$		-0.0226	-1.21	-0.0205	-1.10
ΔRET_{t-1}		0.0568***	5.46	0.0603***	5.79
ΔROE_{t-1}		-0.2433***	-8.28	-0.2442***	-8.36
$\Delta \log SALES_{t-1}$		-0.0762***	-4.33	-0.0746***	-4.26
ΔRET_{t-2}		0.0218**	2.29	0.0236**	2.48
ΔRET_{t-3}		-0.0039	-0.51	-0.0024	-0.32
$SIZE$		0.0021	0.75	0.0164	0.93
$Imbalance$		0.0050	0.23	0.0074	0.32
N		1,014		1,013	
Adj R-sq		0.3306		0.3348	

Note: the sample firms are those with variance of ROE and variance of RET both above the sample median. In Model 1 (Model 2), $SIZE$ is the average value (percentile) of board size and compensation committee size, $Imbalance$ is the absolute difference between the average of PCT and $SEPCHR$ and the sample median of the average. PCT is the average value (percentile) of independent directors' percentage in the board and that in the committee; $SEPCHR$ is a dummy variable that equals 1 if CEO and Chair of board is separate and 0 otherwise.

*, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1% (one-tailed where prediction is uni-directional).

Table 2.7 Test of the asymmetry in using private information to reward and punish CEOs

Panel A. Regress CEO cash pay on currently observable performance measures, and retain ε_{comp}

$$\begin{aligned}\Delta \log COMP_t &= \alpha_0 + \alpha_1 \Delta RET_t + \alpha_2 \Delta ROE_t + \alpha_3 \Delta \log SALES_t \\ &+ \alpha_4 \Delta RET_{t-1} + \alpha_5 \Delta ROE_{t-1} + \alpha_6 \Delta \log SALES_{t-1} \\ &+ \alpha_7 \Delta RET_{t-2} + \alpha_8 \Delta RET_{t-3} + \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon_{comp}\end{aligned} \quad (1),$$

	Predicted Sign	Coef.	t-stat
Intercept		0.0308	0.43
ΔRET_t	+	0.2687***	16.51
ΔROE_t	+	0.6581***	11.61
$\Delta \log SALES_t$	+	0.3568***	12.21
ΔRET_{t-1}	+	0.1625***	8.24
ΔROE_{t-1}	+	0.0334	0.61
$\Delta \log SALES_{t-1}$	+	-0.1420***	-5.00
ΔRET_{t-2}	+	0.0455**	2.48
ΔRET_{t-3}	+	-0.0009	-0.06
N		3,402	
Adj R-sq		0.2448	

Panel B. Regress future firm performance on current firm performance, and retain residual ε_{froe}

$$\begin{aligned}\Delta ROE_{t+1} &= \alpha_0 + \alpha_1 \Delta RET_t + \alpha_2 \Delta ROE_t + \alpha_3 \Delta \log SALES_t \\ &+ \alpha_4 \Delta RET_{t-1} + \alpha_5 \Delta ROE_{t-1} + \alpha_6 \Delta \log SALES_{t-1} \\ &+ \alpha_7 \Delta RET_{t-2} + \alpha_8 \Delta RET_{t-3} + \sum \gamma_i IndustyDum_i + \sum \lambda_j YearDum_j + \varepsilon_{froe}\end{aligned} \quad (2),$$

	Predicted Sign	Coef.	t-stat
Intercept		0.0341*	1.73
ΔRET_t	+	0.0682***	14.92
ΔROE_t	-	-0.4025***	-24.80
$\Delta \log SALES_t$	+	0.0084	1.03
ΔRET_{t-1}		0.0419***	7.66
ΔROE_{t-1}		-0.2170***	-13.96
$\Delta \log SALES_{t-1}$		-0.0520***	-6.54
ΔRET_{t-2}		0.0173***	3.37
ΔRET_{t-3}		-0.0061	-1.50
N		3,385	
Adj R-sq		0.262	

Panel C. Regress ε_{comp} on ε_{froe} conditional on the sign of the latter residual term

$$\varepsilon_{comp} = \alpha_0 + \alpha_1 \varepsilon_{froe} + \alpha_2 NEG \times \varepsilon_{froe} + \alpha_3 NEG + \nu \qquad (3),$$

		Model 1		Model 2	
	Predicted Sign	Coef.	t-stat	Coef.	t-stat
Intercept		0.0007	0.15	-0.0074	-0.79
ε_{froe}	+	0.1915***	3.17	0.2634**	2.10
$NEG \times \varepsilon_{froe}$	?			0.0191	0.11
NEG				0.0187	1.39
N		3,306		3,306	
Adj R-sq		0.0027		0.0027	

Note: COMP is the sum of salary and bonus awarded to CEO, ROE represents firm's return on common equity, RET stands for firm's annual market return, and SALES represents firm's sales. Except for $IndustyDum$ and $YearDum$, all variables are change measures. The subscripts t+1, t, t-1, t-2, and t-3 represent the subsequent year, the current year, and the three prior years, respectively. For example, ΔROE_{t+1}, ΔROE_t and ΔROE_{t-1} are the changes of firm's return on equity in the subsequent year, current year, and prior year. Fixed effects for year and two-digit industry are included ($IndustyDum$ and $YearDum$). ε_{comp} is the residual from the first stage regression, representing the portion of CEO compensation that cannot be explained by currently observable performance measures. ε_{froe} is the residual from the second stage regression, which captures the component of future performance that cannot be foreseen by outside investors. NEG is a dummy variable that equals 1 if ε_{froe} is negative and zero otherwise.

*, **, *** denote, respectively, two-tail significance levels of 10%, 5%, and 1% (one-tailed where prediction is uni-directional).

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Chapter 3— Once a liar, always a liar? What do previous backdating firms do after SOX 403?[1]

3.1 Introduction

Recent studies find that backdating was prevalent in firms with executive stock options prior to year 2002 (Heron and Lie, 2007; Bizjak et al., 2007). The term "backdating" refers to the practice of *retroactively* picking a day when company's stock price is particularly low to be the option grant date, regardless of the real date that executive stock options are granted. By doing so, executives can increase the value of option grants, most of which have an exercise price equal to the grant-day stock price. Backdating was feasible prior to 2002 because firms did not have to report their executive option grants to the Securities and Exchange Commission (SEC) until 45 days after the fiscal year end. This lag between the option grant date and the SEC filing date creates opportunities for firms to use hindsight and pick a favorable grant date to report other than the true date.

Alternative to backdating, firms can also *proactively* time option grants or time corporate news announcements in a strategic way so that options are granted after bad news or before good news, when the stock price is relatively low. This paper labels such practice as "strategic timing"[2]. Compared to strategic timing, which requires executives to use imperfect foresight of the market impact of corporate news, backdating (prior to 2002) ensures larger benefits to executives as they can use their hindsight to accurately identify a date with the lowest stock price.

[1] A version of this chapter will be submitted for publication. Wu, S. Once a liar, always a liar? What do previous backdating firms do after SOX 403?

[2] Strategic timing includes both timing of option grants around corporate disclosures and timing of corporate disclosures around option grants. This paper does not attempt to make a distinction between the two strategic choices.

However, backdating is no longer feasible after the passage of the Sarbanes-Oxley Act (SOX) Section 403, which requires that executive option grants be reported to the SEC within two business days following the transaction day. As pointed out by Narayanan and Seyhun (2005), "The two-day reporting requirement imposed by SOX makes it impossible to materially boost the value of the option grant through backdating without appearing to violate the reporting requirement. This is because if options are backdated by more than two days, it will appear as if the grants are being reported late. If the timely reporting requirement is to be met, the manager can backdate utmost by only two days…Therefore, it is reasonable to expect that this avenue of influencing is effectively closed if managers adhere to the timely reporting requirement of SOX."

Now that backdating is largely restricted by the new regulation, a natural question to ask is: "What would previous backdating firms do in response?" Specifically, do firms also cut back on other ways to inflate option values, or do firms resort to alternative strategies? This is an important question without a clear answer ex ante.

On the one hand, previous backdating firms have incentives to keep manipulating their option grants in one way or another after the new SEC requirement. Both backdating and strategic timing are driven by executive incentives to maximize their personal payoffs; therefore, firms/CEOs are more likely to engage in such practices if potential gains are large and costs relatively small. Consistent with this notion, prior studies show that smaller and more volatile firms that grant larger options to executives are more aggressive in backdating. As firm characteristics are rather stable over time, incentives for opportunistic timing have a tendency to persist (Bebchuk et al., 2007).

On the other hand, however, due to intensified scrutiny in the post-SOX period, previous backdating firms could choose to stay away from any opportunistic behavior that can potentially

draw attention from the public and/or the regulatory authority. This tension between incentives and regulatory pressure provides an opportunity to study whether the new regulation has entailed indirect consequences of stimulating alternative ways to manipulate the timing of option grants.

To study this question, it is important to have a control group which was not previously involved in backdating and thus has been relatively unaffected by the new SEC requirement[3]. This group of firms serves as a benchmark to identify any abnormal return patterns in the post-SOX period. If previous backdating firms quit backdating without resorting to other ways of manipulation, then a similar return pattern around grant dates should be observed for the backdating firms and the non-backdating control group in the post-SOX period. However, if previous backdating firms continue manipulation, they will exhibit significantly larger return reversals around option grants (a sharper V-shape) after SOX, compared to the non-backdating control group.

To test the use of strategic timing, I directly examine two major types of corporate disclosures—earnings announcements and management forecasts, and the distribution of executive option grants around these news announcements. An asymmetric distribution, characterized by more (less) option grants following than preceding bad (good) news, would be indicative of strategic timing. Heron and Lie (2007) find that firms who delay their SEC filings in the post-SOX period exhibit larger return reversals around option grants. They interpret the finding as evidence of firms continuing backdating after SOX. As backdating can result in a similar pattern of negative news right before option grants and/or positive news right after, I further examine the number of business days between the option grant date and the SEC filing date (later referred to as "the reporting lag") to differentiate strategic timing from backdating in

[3] The regulation also applies to this group of firms, but they are "unaffected" in the sense that they do not need to change behavior.

the post-sox period. As a retroactive process, backdating requires a reasonably long reporting lag to make hindsight profitable, whereas strategic timing, proactive in nature, does not.

Using a sample of 23,808 firm-grants from 1998 to 2006, I find evidence that previous backdating firms are still engaged in option grants manipulation subsequent to SOX 403 and that they use strategic timing as the tool to inflate option values. The main findings are as follows. First, after 2002, previous backdating firms experience **2.6 times** as large return reversal around option grant dates as the non-backdating control group. The difference between these two groups is significant both economically and statistically and is robust to controlling for stock return volatility. Second, there is no evidence that previous backdating firms delay their SEC filings after SOX, compared to the non-backdating control group, suggesting that backdating is not what drives the larger return reversal observed. Third, in the post-SOX cases where previous backdating firms experience large return reversals around option grants, a pattern consistent with strategic timing is found: more (less) bad news (good news) precedes than follows option grants. Further more, this pattern persists after excluding firms who reported their grants beyond two business days, suggesting that it is an indication of strategic timing rather than backdating.

Several recent studies have examined the effect of SOX on timing of executive option grants. Examples include Collins et al. (2005), Huang and Lu (2008), and Narayanan and Seyhun (2005). Compared to existing research, this paper is unique in a number of ways.

First, this paper studies the indirect consequences of SOX 403. Recent research has consistently shown that the V-shaped return pattern around option grant dates has been dampened after the SEC's two-day reporting requirement came into effect. This evidence confirms that backdating was the primary tool used by firms to inflate option values prior to SOX (Heron and Lie, 2007). Not surprisingly, the tightened reporting requirement effectively

curtailed this particular behavior. However, as backdating is not the only mechanism for firms to inflate option values and proactive timing is still feasible under the new reporting requirement, it is important to know whether firms resort to alternative manipulating tools in response to the regulation change. After all, the abnormal return pattern is not eliminated in the post-SOX period (Narayanan and Seyhun, 2005), suggesting the existence of some sort of opportunistic behavior.

Second, the focus of this paper is on firms that previously engaged in backdating of executive option grants. I use a group of non-backdating firms as a benchmark. This research design provides unique evidence on whether former backdaters still engaged in opportunistic behavior subsequent to SOX 403. In contrast, the cross-time comparison (pre-SOX vs. post-SOX), widely employed by prior research studying the impact of SOX on backdating, shows a general change in all firms.

Third, it has been a challenge to determine whether backdating or strategic timing drives the V-shaped return pattern around option grant dates. Evidence of corporate news patterns around grant dates, as presented by some recent studies in an effort to differentiate strategic timing from backdating, unfortunately does not suffice. By retroactively searching for a low-price date, backdating would very likely result in a grant date that is followed by good news announcements and/or preceded by bad news announcements, as would strategic timing. In this paper, I make a clearer distinction between the two practices by examining the lag between the option grant date and the SEC filing date. Backdating can be beneficial only when the reporting lag is sufficiently long so that firms can go back in time to choose favorable grant dates from the past. In contrast, strategic timing does not require a reporting lag.

Last, to study the strategic timing of news announcements relative to option grants, this paper considers two major types of corporate disclosures: earnings announcements and management forecasts. Among post-SOX studies on strategic timing, this is the most comprehensive in terms of news measures. Including both types of corporate disclosures reduces the likelihood of misclassifying the timing of option grants relative to corporate news. For example, managers could pre-empt bad news by issuing a pessimistic management forecast before announcing earnings when options grants are scheduled shortly before the earnings announcement date (Aboody and Kasznik, 2000). This strategic behavior would be misclassified as non-strategic if only the earnings announcement is considered. Similarly, non-strategic actions can be misclassified as strategic if only one type of disclosure is examined.

The remainder of this paper is organized as follows. Section 2 reviews related literature and develops testable hypotheses. Section 3 discusses the research design and describes the data. Section 4 summarizes the results, and section 5 concludes.

3.2 Prior literature and hypotheses

Executive stock options (ESOs) are usually granted at-the-money, i.e., the exercise price of the options is set to equal the market price of the underlying stock on the grant date. Favorable tax treatment is available as long as the exercise price is at least as high as the grant-date stock price (i.e., at-the-money or out-of-the-money). The prevalence of granting options at-the-money is, by itself, an indication of the desire to maximize benefits to the executives. Because the option value is higher if the exercise price is lower, executives prefer to be granted options when the stock price is low. There are mainly two mechanisms that executives exploit to lower the exercise price of ESOs: backdating (*retroactive*) and strategic timing (*proactive*).

3.2.1 Backdating and strategic timing

Before backdating became widely recognized by the public and academia, research focused on how executives strategically time option awards and/or time corporate disclosures to obtain a favorable stock price on the option grant date. Yermack (1997) finds that abnormal stock returns move upward after CEOs receive options, and he interprets the findings as evidence of opportunistic timing of option awards around company news announcements; or, CEOs choose to receive stock option awards right before favorable news that pushes company stock prices higher. Using a sample of option awards with fixed schedules, Aboody and Kasznik (2000) find evidence that CEOs manage investors' expectations around award dates by delaying good news and rushing forward bad news. Their findings suggest that CEOs make opportunistic voluntary disclosure decisions that maximize their stock option compensation.

Timing of option awards and timing of corporate disclosures involve using private information about **future** events to **proactively** plan an action date (grant options or issue corporate news). In this paper, both of these actions are labeled "strategic timing". Backdating is fundamentally different from these practices as it involves using hindsight of **past** events to **retroactively** pick a grant date with low stock price. Compared to strategic timing, backdating is obviously a much more effective way for executives to maximize their stock option compensation. Unlike hindsight, private information about future events can never be perfectly precise. Moreover, backdating can capitalize on any event that has caused fluctuation in stock prices, whereas strategic timing is limited by the set of corporate disclosures over which managers have full control. Therefore, as long as backdating is feasible it is the most effective tool to inflate option values.

Until 2002, backdating did not attract much attention from the public, academia, and the authority. Unlike strategic timing, which entails litigation risks related to insider trading, backdating was undetected (or "riskless" in an ex post point of view) prior to 2002. There had been no articles on backdating in the Wall Street Journal until November 2005 (Huang and Lu, 2008). One of the first academic papers that document evidence of backdating is Lie (2005). He finds a V-shaped return pattern around executive option awards, and further documents that the **predicted** returns are abnormally low before the awards and abnormally high afterward. "Unless executives possess an extraordinary ability to forecast the future market-wide movements that drive these predicted returns, the results suggest that at least some of the awards are timed retroactively (backdated)".

3.2.2 The Sarbanes-Oxley Act (SOX) Section 403

One restriction that applies to backdating but not strategic timing is that backdating requires a certain length of time in the past from which to choose grant dates. As firms must report their executive option grants to the SEC before a deadline, the length of time they could manipulate essentially depends on the lag between the grant date and the filing deadline set by the SEC. Prior to 2002, firms were required to file information on executive option grants to the SEC on Form 5, within 45 days after the firm's fiscal year end. That is to say, on the option filing date, there was up to a year of hindsight, which makes backdating a feasible and plausible strategy to maximize executive option values.

Starting from August 2002, the new rules mandated by Section 403 of SOX require executive option grants to be reported on Form 4 and filed within two business days after the transaction date.

Heron and Lie (2007) hypothesize that if backdating produced the abnormal return patterns around executive option grants prior to 2002, the new reporting requirements should substantially dampen the abnormal return patterns. The rationale underlying their argument is that backdating can only succeed when the reporting lag is sufficiently long so that on the filing date firms can go back in time to choose favorable grant dates from the past. In contrast, other proactive timing practices can persist no matter how stringent the reporting requirement is. Their finding of a much weaker V-shaped return pattern around executive option grants since August 2002 supports the allegation that most of the abnormal return pattern around option grants for the pre-2002 period is attributable to backdating of option grant dates.

As the most effective tool to manipulate option grants has been restricted by SOX 403, it is not surprising that managers are found to be less successful in manipulating the grant-date stock price subsequent to SOX. By comparing the pre-SOX and post-SOX patterns of abnormal returns and patterns of earnings announcements around option grant dates, Collins et al. (2005) find that in general the extent to which CEOs manipulate the timing of option grants has been reduced in the post-SOX period. Narayanan and Seyhun (2005) find that after the imposition of the two-day reporting rule post-grant date stock returns are positive but lower in magnitude than pre-SOX figures, suggesting that SOX has curtailed, but not eliminated, managerial influencing of the grant day stock price.

Put together, findings of prior studies are suggestive of the following: 1. in the pre-SOX period backdating was the primary tool used by firms to maximize executive option values; 2. the practice of backdating heavily depends on the lag between the option grant date and the SEC filing date, thus has been largely restricted by SOX 403; 3. some opportunistic behavior may still exist in the post-SOX period, driving the abnormal return pattern around option grants after 2002.

3.2.3 Previous backdating firms: incentives vs. regulatory pressure

Firms that are most affected by the new reporting requirement are the ones most heavily engaged in backdating prior to 2002. It is an interesting question as to what these firms would do to respond. The two-day reporting requirement severely limits opportunities for backdating: firms can backdate at most two days from the filing date. This limit has different implications depending on the price pattern. Firms can have a rolling two-day window for backdating if the stock price has been falling after the real grant date; however, they can take advantage of price increases over two days at most. Do executives at previous backdating firms resort to strategic timing to maintain part of management private gains from backdating? Or do they quit all means of opportunistic timing to shun risks of being investigated by the SEC? The answer depends on the tradeoff between incentives and the regulatory pressure.

Prior research finds that incentives for backdating vary across firms. For example, firms are more likely to backdate options if they are high-tech firms, smaller in size, more volatile, and if they grant larger amount of options and have a board member linked to another firm identified as backdating option grants (Bebchuk et al., 2007; Bizjak et al., 2007; Heron and Lie, 2006). Gains from backdating are significant: in firms accused of backdating, executives would have benefited by $500,000 per firm per year if they had backdated on every grant date when backdating is profitable (Narayanan et al., 2006). Given that firm characteristics are stable over time and gains from backdating were large, incentives are likely to be strong for previous backdating firms to keep manipulating the grant day. Consistent with this view, Bebchuk et al. (2007) find that firms are more likely to opportunistically time option grants if they have done so historically.

On the other hand, the post-SOX regulatory climate could have discouraged firms from manipulating option grants. Executives' actions are under intensified scrutiny subsequent to

SOX. Backdating, in particular, has drawn increasing attention from the public and regulatory authorities. Up to 2007, 141 firms have come under scrutiny for past stock option grants, either through internal probes or investigations by the SEC or the Justice Department[4]. Such scrutiny entails large economic consequences to shareholders: firms lost on average market value of $389 million during the twenty-one days around the first announcement that implicated a firm in backdating (Narayanan et al., 2006). In 33 of the 141 firms, such investigations have resulted in resignations or firings of executives and directors.

This tension between regulation and incentives makes it an interesting question as to whether previous backdating firms would continue manipulating executive option grants through strategic timing subsequent to SOX 403.

H1a: After SOX, firms that previously engaged in backdating resort to strategic timing more than non-backdating firms.

H1b: After SOX, firms that previously engaged in backdating quit manipulating the grant-date stock price through either backdating or strategic timing;

3.3 Research design and sample

3.3.1 Research design

To test these hypotheses, I first identify a group of firms that were heavily engaged in backdating prior to 2002. These firms, labeled as "previous backdating firms", are the most affected by SOX 403. Following Bizjak, Lemmon and Whitby (2007), a "backdated option

[4] The *Wall Street Journal* maintains a list of companies on its website that are under investigation by the SEC and/or the Justice Department. *See* The Wall Street Journal Online, Perfect Payday, Options Scorecard, http://online.wsj.com/public/resources/documents/info-optionsscore06-full.html (last updated Sep. 4, 2007).

grant" is one which has a greater than 10% negative abnormal return in the 20-day period prior to the reported grant date, followed by a greater than 10% positive abnormal return in the 20-day period following the reported grant date.[5] A firm is categorized as a "backdating firm" if over 50% of its option grants to top executives (CEO, President, and Chair of the board) are backdated during the period of 1998-2002[6]. Using the V-Shaped return pattern to identify backdating firms reduces the likelihood of misidentification as it captures a significant shock in a relatively short time frame. Alternatively, prior research (Collins et al, 2009) defines backdating as occasions where the stock price on the option grant day is within the lowest price range over the year. While this approach corresponds with the idea that backdating results in a low stock price on the option grant date, it could misidentify firms with performance enhanced as a result of the incentive role of the options grants as firms engaged in backdating.

Second, I identify a group of firms with none of their option grants to top executives being backdated (as defined above) during 1998-2002. This group, labeled as the "non-backdating control group", serves as a benchmark to detect any post-SOX opportunistic behavior of the previous backdating firms. If previous backdating firms quit manipulating option grants subsequent to SOX, we should observe a similar return pattern around option grants for the two groups of firms. However, if they continue to manipulate, we would observe a more evident V-shape in the return pattern of previous backdating firms compared to the control group.

Third, to test the hypothesis on strategic timing, I find for each grant the corporate disclosure that is closest to the option grant date. I consider both earnings announcements and management forecasts as they represent, respectively, the most frequent mandatory disclosures and voluntary

[5] Most of the V-shaped abnormal return pattern around option grants for the pre-2002 period is attributable to backdating of option grant dates (Heron and Lie, 2007; Bebchuk et a., 2007).
[6] I focus on a relatively recent period because prior research shows that the V-shaped return pattern induced by backdating has intensified over time and has become most evident from late 1990s to 2002.

disclosures that move the stock price. Managers can time option grants before or after quarterly earnings announcements depending on the expected news content. For management forecasts, they can also adjust the timing and frequency. Moreover, managers often exploit the relative timing of management forecasts and earnings announcements to create a favorable price pattern (Aboody and Kasznik, 2000).

Fourth, for each post-SOX grant I calculate the number of business days between the option grant date and the SEC filing date. Prior research (Heron and Lie, 2007; Narayanan and Seyhun, 2005) proposes backdating as a potential explanation for the remaining V-shaped return pattern around option grants after SOX, especially in firms who delay filing option grants to the SEC[7]. As backdating and strategic timing can result in a similar pattern of bad news preceding grants and good news following grants, I further examine the post-SOX reporting lag to differentiate these two explanations. Post-SOX backdating must have a prolonged reporting lag exceeding two business days, whereas strategic timing does not.

3.3.2 Sample

The sample of executive option grants is obtained from the Thomson Financial Insider Filing database. Following Heron and Lie (2007), only observations with a cleanse indicator of R (‘‘data verified through the cleansing process), H (‘‘cleansed with a very high level of confidence’’), or C (‘‘a record added to nonderivative table or derivative table in order to correspond with a record on the opposing table’’) are included. The initial sample contains 60,538 unique firm-grants to CEOs, Presidents, and Chairs of the boards from 1986 to 2007, and the requirement of stock return data from CRSP reduces the sample to 47,241 firm-grants.

[7] Heron and Lie (2007) state that “we were unable to uncover any formal criteria used by the SEC to materially reprimand late filers other than providing an Item 405 disclosure in the issuer’s proxy statement and 10-K indicating late Section 16 filings. Thus, to this point, any penalties associated with filing late appear to be trivial, if anything”.

To identify pre-SOX backdating and non-backdating firms, I start with executive option awards issued before August 2002 (32,388 observations). For each firm-grant, I calculate the buy-and-hold abnormal return (BHAR) in the 20 days before and 20 days after the reported grant date, measured as the difference between the buy-and-hold return of the firm and the buy-and-hold return of the market portfolio. Option grants are identified as "backdated" if BHAR < -10% in the 20 days before the grant date, followed by BHAR > 10% in the 20 days afterwards. Grants made by one firm to multiple executives on the same day are counted only once; i.e., the identification of backdating is conducted at the grant-day level. Table 3.1 panel A reports the percentage of executive options being backdated in each year. The increasing frequencies over time suggest that executives became more and more aggressive at backdating until 2002, consistent with findings of Lie (2005) and Bizjak, Lemmon and Whitby (2007). In the last five periods (1998 to 2002), over 10% of executive option grants in each year show evidence of backdating. In light of the fact that backdating was relatively scarce prior to 1998, I use only the most recent five-year period (1998-2002) to identify backdating firms.

For each firm that issued executive option grants during 1998-2002, I calculate the percentage of option grants being backdated over this period as a firm-specific measure of backdating intensity. Distribution of this measure is tabulated in Table 3.1 panel B. On average, a firm backdates 12% of its executive option awards in the period of 1998-2002. 10% of the sample firms show evidence of intensive backdating and are categorized as "backdating firms": they backdated more than half of their option grants from 1998 to 2002. The majority of firms who show no evidence of backdating during this period are categorized as "non-backdating firms".

After identifying firms as backdating and non-backdating, I focus on option grants to CEOs only in the main analysis, leading to a total of 23,808 firm-grant-day observations[8]. I use this sample to study the pattern of stock returns around option grant dates before and after SOX. Among these observations, 12,927 are dated before 2002, and 8,292 after 2002. For the test of strategic timing, I obtain quarterly earnings announcements data from COMPUSTAT, and management forecasts data from First Call Company Issued Guidance. The requirement of corporate disclosure data further reduces the sample to 23,253 observations.

Table 3.2 panel A provides descriptive firm statistics for the fiscal year prior to the option grants and panel B presents industry composition. Consistent with prior research (Bebchuk et al., 2007; Heron and Lie, 2006), backdating firms are on average much smaller in size than non-backdating firms, as evidenced by total assets (mean of $1.1 billion vs. 6.8 billion) and market capitalization (mean of $0.77 billion vs. 4.2 billion). In addition, the median book-to-market ratio is significantly lower for the backdating sample, which appears to have a higher proportion of firms in the high-tech industries (computer, electronic equipment, and pharmaceutical products) and a lower proportion in financial and utilities.

3.4 Empirical results

3.4.1 Abnormal returns around option grants

Figure 3.1 displays the average cumulative abnormal returns around option grant dates (from 20 days before through 20 days after) for backdating firms and non-backdating firms in the pre-SOX and post-SOX periods (Panels a and b, respectively). By definition, backdating firms

[8] Focusing on CEOs mitigates the effect of change of management in the post-SOX period.

exhibit an evident V-shaped return pattern around option grant dates, with a mean 14% decline in cumulative BHAR prior to the grant date and an 18% reversal in 20 days after. In contrast, non-backdating firms exhibit a relatively constant price trend before the grant date and a modestly increasing pattern afterwards.

Interestingly, in the post-SOX period, a sharp return reversal is still observed around option grants in previous backdating firms (see figure 3.1b). Specifically, previous backdating firms experience a price decline immediately before the option grant, followed by an increase immediately after, leading to a 4.5% abnormal return at the end of the accumulation window. Non-backdating firms, however, exhibit a relatively constant price trend before option grants and only a slight increase after option grants. The 20-day abnormal return is around 2.5%.

A comparison between pre-SOX and post-SOX patterns shows that backdating firms experience a much sharper return reversal around option grants in the pre-SOX period, when backdating of option grants is feasible and heavily used. For non-backdating firms, the return pattern is almost the same before and after SOX: returns are constant and close to zero before option grants, followed by a slight increase to around 2.5% at the end of the 20-day window. Thus, non-backdating firms have been relatively unaffected by SOX 403 and they can serve as a benchmark group to detect post-SOX opportunistic behavior in previous backdating firms.

For a closer examination, Table 3.3 reports the magnitude of return reversals around option grants prior to and subsequent to SOX, for non-backdating firms and backdating firms, respectively. Both raw returns and abnormal returns are examined. Reversal of raw (abnormal) returns is measured as the buy-and-hold (abnormal) return of 20 days after the grant minus the buy-and-hold (abnormal) return of 20 days before the grant.

Panel A compares the overall return reversal before and after SOX. The mean reversal of raw (abnormal) returns declines from 7.8% (7.4%) before SOX to 2.7% (2.3%) after SOX, consistent with prior evidence that backdating has been curtailed after the new reporting requirement came into effect. More importantly, Panel B compares the post-SOX return reversals of backdating firms and non-backdating firms. Subsequent to SOX, the mean reversal of raw (abnormal) returns is 5.5% (5.0%) in previous backdating firms, compared with 2.1% (1.8%) in the non-backdating control group. That is, previous backdating firms experience return reversals on average **2.6 times** as large as non-backdating firms (significant at the 1% level). These findings suggest that firms that backdated options before tend to keep manipulating option grants in the post-SOX period, rejecting Hypothesis 1b.

Since backdating firms and non-backdating firms are different in size and industry composition, the larger return reversal observed in backdating firms could potentially be attributed to their more volatile stock returns. To address this issue, I further examine the magnitude of return reversal with a control for stock return volatility. Volatility is measured as the standard deviation of daily stock returns in the 50 to 70 trading days subsequent to the grant date[9]. This measurement window avoids the confounding effect of the current option grant and is far enough from the next grant date. Panel C reports the regression results. The coefficient on the volatility measure is consistently positive and significant, suggesting that it is one important factor that drives the reversal of stock returns. However, after controlling for volatility, previous backdating firms still exhibit a significantly higher reversal of both raw returns and abnormal returns. The incremental return reversal is 2.1%. This finding confirms that the larger return

[9] Other volatility measures, such as the standard deviation of monthly stock returns from two to nine months after the grant date, do not change the results.

reversal observed in backdating firms in the post-SOX period is not purely driven by volatility, but an indication of opportunistic behavior.

3.4.2 The reporting lag

Hypothesis 1a predicts strategic timing to be the mechanism used by previous backdating firms after SOX. Alternatively, prior studies argue that firms in the post-SOX period could still backdate option grants if they file late to the SEC. To make a distinction between these two explanations, I next examine firms' reporting lags in the post-SOX period. Strategic timing involves planning the date of option grants relative to the date of corporate news announcement in a proactive manner, and therefore entails no difficulty for the timing firm to meet the two-day reporting requirement. However, to be able to continue backdating, firms will inevitably have to delay filing their option grants to the SEC.

I measure the reporting lag as the number of business days between the option grant date and the SEC filing date[10]. Grants are deleted if their SEC filings have been amended to reflect corrections or adjustments; filing dates recorded for these grants are the final amendment dates which can be years after the transaction dates, resulting in misleadingly large reporting lags. Table 3.4 presents the post-SOX reporting lag for previous backdating firms and non-backdating firms. There is no evidence that backdating firms delay their SEC filings relative to the non-backdating control group. Specifically, both groups have a median reporting lag of two business days, and 75 percent of firms in both groups adhere to the two-day reporting requirement.[11]

[10] Using the number of calendar days between two dates does not change the results.

[11] I examine the Form 4 filings in EDGAR for a number of option grants that are filed late and find the following: 1. Those seemingly extreme reporting lags (top 1%) are not driven by data errors—executives do sometimes file two to three years after the option grant date. 2. Late filings are disclosed in proxy statements in a succinct manner. A typical proxy statement disclosure goes "the Company believes that all of these filing requirements were timely satisfied during 2003 by its directors, officers and ten percent holders, except each of the following made late filings: Messrs. Connors, Meehan and Merritt - 4 reports, 5 transactions…" (Cognitronics Corp, 2004)) 3. Most filers do

Previous backdating firms on average have a slightly larger reporting lag than non-backdating firms, but the mean difference is not statistically significant. Figure 3.2 displays the distribution of SEC filing time in the post-SOX period. Distribution for previous backdating firms and that for non-backdating firms largely resemble each other. These findings suggest that backdating is not the mechanism used by previous backdating firms to manipulate the option grants and render support to Hypothesis 1a.

3.4.3 Timing of option grants relative to corporate disclosures

Evidence of a sharper return reversal in previous backdating firms and no evidence of these firms delaying SEC filings together suggest previous backdating firms used alternate strategies subsequent to SOX 403. In particular, strategic timing of option grants after bad news and/or before good news (or issue bad news before option grants and good news after option grants) would help lower the grant-date stock price. To provide direct evidence on strategic timing, the pattern of corporate disclosures around option grant dates is examined.

For each option grant, I find the corporate disclosure (earnings announcement or management forecast) that is closest to the option grant date. I classify it as good news if the 3-day Cumulative Abnormal Return (CAR) is non-negative around the disclosure date and bad news otherwise. An option grant is pre-news (post-news) if the grant date is within 30 days prior to (after) the corporate disclosure date. Table 3.5 tabulates the frequency of option grants before and after corporate news. To enhance the power of the test, I focus on the sub-sample of option grants issued by previous backdating firms after SOX that are associated with abnormally large

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not provide any specific explanation for late filings, either in Form 4 or in proxy statements. The only explanations I can find are rather general, e.g., "administrative errors" or "transaction was inadvertently not reported."

return reversals, i.e., in the fourth quartile of the post-SOX sample. These firm-grants are most likely indicative of opportunistic behavior.

Panel A shows a pattern consistent with strategic timing in the post-SOX cases where previous backdating firms experience abnormally large return reversals (reversal >= 10%, 3rd quartile) around option grants. Specifically, 71% of these option grants are issued within 30 days of corporate disclosures. 30% of the grants are issued after Bad news but only 10% beforehand; 18% of the grants are issued before Good news but only 13% afterwards. Chi-square test rejects the equality of frequency between Pre-Good-news (Pre-Bad-news) grants and Post-Good-news (Post-Bad-news) grants. Similar results (not reported for brevity) are found if I select firms from the non-backdating sample that have post-SOX return reversals of greater than 10%. Thus, my sample of non-backdating firms contains some firms that display patterns consistent with timing option grants in the post-SOX period, as found in my back-dating sample. I have not yet extended the analysis to the full sample of non-backdating firms (due to data collection costs), but the result does point to a need to extend the analysis to the full sample of non-backdating firms. Such an extension of the current analysis would allow for more refined conclusions regarding whether back-dating firms do more timing of option grants following SOX than do non-backdating firms.

For comparison, I then examine the distribution of option grants around corporate news in the pre-SOX backdating cases. Not surprisingly, there also appears to be a pattern consistent with strategic timing: 22% of the option grants are issued after Bad news but only 10% beforehand; 24% of the grants are issued before Good news but only 9% afterwards. This evidence shows that one cannot distinguish backdating from strategic timing solely based on the pattern of option grants relative to corporate news (nor is a V-shape in stock returns definitive evidence of actual

backdating). Backdating, as well as strategic timing, results in option grant dates that are right after bad news and/or right before good news.

A further investigation of the SEC filing time is warranted before any inferences on strategic timing can be drawn from the finding in Panel A. If backdating is what drives the pattern observed in Panel A, these firm-grants would have to be reported late to the SEC. This is found not to be the case. As in the full sample, 75% of these option grants are filed to the SEC within two business days, giving practically no leeway for backdating. In addition, the timing pattern remains evident after excluding the 25% firm-grants that are reported to the SEC beyond two business days. As shown in Panel C which includes only option grants filed on time, 32% are issued after Bad news but only 8% beforehand; 17% of the grants are issued before Good news but only 12% afterwards. If anything, the asymmetry in frequency between pre-bad-news and post-bad-news is even greater after excluding option grants that are filed late. This evidence eliminates the possibility that backdating contributes to observed return reversal post-SOX. Thus, it is strategic timing that drives the asymmetric timing pattern observed.

Figure 3.3 compares the distribution of option grants around corporate disclosure dates before and after SOX. The dark bars correspond to option grants that are backdated in the pre-SOX period, and the light bars correspond to option grants that are issued by previous backdating firms in the post-SOX period and associated with abnormally large return reversals. In general, pre-SOX option grants are evenly distributed before and after corporate news announcements, with the largest proportion of grants (11.5%) issued within 2-3 days around the corporate disclosure. In comparison, a larger proportion of post-SOX option grants are issued right *after* corporate disclosures than right before, with a peak of 13.3% issued within 2-3 days around the corporate disclosure.

For a closer examination, Figure 3.3b and 3.3c separately display the distribution of option grants around bad news and good news. Option grants issued by backdating firms in the post-SOX period are asymmetrically distributed around bad news, with more grants right after news than right before, and the asymmetry gets larger compared to pre-SOX backdating cases. This evidence suggests that previous backdating firms exploit bad news disclosures to a larger extent in the post-SOX period. No such evidence is found around good news disclosure. Even though post-SOX grants are asymmetrically distributed around good news, with a larger proportion issued right before than right after, the extent of asymmetry is lower than in the pre-SOX backdating cases.

Put together, the evidence suggests that while previous backdating firms are engaged in strategic timing after SOX, they are at the same time cautious about the litigation risk associated with trading on inside information. Prior literature document that insiders exploit voluntary disclosure opportunities for personal gain only when litigation risk is sufficiently low (Cheng and Lo, 2006), and that managers avoid making insider transactions to profit from news about their own firms just before it becomes publicly available, but wait until after when information asymmetry with outside investors is likely to be relatively low (Noe, 1999). As option grants are analogous to share purchases, it entails higher litigation risk to issue CEO grants just before announcing corporate news[12].

[12] It is in contravention of the "disclose or abstain" doctrine, which requires that insiders in possession of material nonpublic information should either disclose it to the investing public before trading or abstain from trading.

3.5 Conclusion

This paper studies firms that engaged in backdating of executive option grants prior to SOX 403 and investigates whether these firms resort to strategic timing afterwards, when the two-day reporting requirement largely curtailed backdating.

Using firms that were relatively free from backdating before SOX as a control group, I find that in the post-SOX period, previous backdating firms exhibit a significantly larger return reversal around option grant dates, suggesting some sort of opportunistic behavior is still going on in these firms. Furthermore, I find that previous backdating firms file their post-SOX option grants to the SEC in as a timely fashion as the non-backdating control group, and that the large return reversal patterns are consistent with strategic timing; that is, a larger proportion of option grants are issued right after bad news (before good news) than right before bad news (after good news). These findings suggest that firms that previously backdated engage in strategic timing as an alternative mechanism to lower the grant-date stock price in the post-SOX period.

This paper adopts a powerful research design that enables a comparison between two groups of firms to identify post-SOX opportunistic behavior in firms where incentives of manipulating option grants are especially strong. It provides unique evidence on the indirect consequences of the Sarbanes-Oxley Act by examining the response of previous backdating firms to the new reporting requirement imposed by SOX 403. Combined with prior evidence in the literature, the findings suggest that managerial opportunism, at least in the U.S., is substantial, persistent, and difficult to eliminate through regulation.

Table 3.1 Distribution of backdating frequency

The following describes backdating frequency by year (Panel A) and backdating intensity by firm (Panel B). Backdating frequency is the percentage of all executive option grants being backdated in a year. Backdating intensity is the percentage of a firm's executive option grants being backdated during 1998-2002. An option grant is diagnosed as being backdated if a lower than -10% raw (abnormal) return is observed in 20 days before the grant date, followed by a higher than 10% raw (abnormal) return in 20 days after. Raw (abnormal) returns are the Buy-and-hold (Abnormal) Returns.

Panel A: Frequency of backdating by year

year	# of option grants	Pct of the full sample	% of option grants being backdated in that year	
			Backdating defined based on raw return	Backdating defined based on abnormal return
1986	5	0.00	0	0
1987	4	0.00	0	0.25
1988	16	0.00	0	0
1989	17	0.00	0.06	0.06
1990	33	0.00	0.09	0.09
1991	51	0.00	0.16	0.12
1992	84	0.00	0.11	0.12
1993	127	0.00	0.04	0.06
1994	238	0.01	0.05	0.05
1995	1,287	0.04	0.08	0.08
1996	3,765	0.12	0.08	0.07
1997	4,851	0.15	0.08	0.07
1998	5,023	0.16	0.11	0.10
1999	4,718	0.15	0.10	0.11
2000	4,736	0.15	0.15	0.14
2001	4,732	0.15	0.14	0.13
2002	2,701	0.08	0.09	0.07

Panel B: Distribution of firm-level backdating intensity during 1998-2002

		% of option grants being backdated by a firm during 1998-2002	
		Backdating defined based on raw return	Backdating defined based on abnormal return
100%	Max	1	1
99%		1	1
95%		0.67	0.6
90%		0.5	0.5
75%	Q3	0.2	0.17
50%	Median	0	0
25%	Q1	0	0
10%		0	0
5%		0	0
1%		0	0
0%	Min	0	0
	Mean	0.12	0.12
	No. of firms	6,050	6,050

Table 3.2 Descriptive statistics

Descriptive firm statistics are for the fiscal year prior to the option grants. Industry composition follows Fama and French (1997) industry classification. A "backdated option grant" is one which has a greater than 10% negative abnormal return in the 20-day period prior to the reported grant date, followed by a greater than 10% positive abnormal return in the 20-day period following the reported grant date. A firm is categorized as a "backdating firm" if it backdated over 50% of its option grants to top executives during the period of 1998-2002 and "non-backdating firm" if it backdated none of its option grants to top executives during the period of 1998-2002.

Panel A: Descriptive firm statistics

	Non-backdating Firms		Backdating Firms	
	Mean	Median	Mean	Median
Total Assets ($millions)	6,758	649	1,132***	132***
Market Value ($millions)	4,180	473	771***	192***
Book-to-Market	0.52	0.44	0.45	0.37***

Panel B: Industry composition

	Non-backdating firms		Backdating firms	
Industry	# of firms	Percent	# of firms	Percent
Agriculture	9	0.29	1	0.21
Aircraft	11	0.36	1	0.21
Alcoholic Beverages	13	0.43	1	0.21
Apparel	37	1.21	7	1.48
Automobiles and Trucks	35	1.15	5	1.06
Banking	245	8.03	5	1.06
Business Supplies	41	1.34	2	0.42
Business Services	373	12.22	123	26
Candy and Soda	4	0.13	1	0.21
Chemicals	65	2.13	3	0.63
Coal	5	0.16		
Computers	130	4.26	33	6.98
Construction Materials	61	2	4	0.85
Construction	41	1.34	7	1.48
Consumer Goods	37	1.21	4	0.85
Defense	7	0.23		
Electrical Equipment	33	1.08	4	0.85
Electronic Equipment	145	4.75	51	10.78
Entertainment	33	1.08	6	1.27
Fabricated Products	16	0.52	3	0.63
Food Products	45	1.47	7	1.48
Healthcare	48	1.57	10	2.11
Insurance	107	3.51	6	1.27
Machinery	97	3.18	16	3.38
Measuring and Control Equip	62	2.03	9	1.90
Medical Equipment	102	3.34	19	4.02
Miscellaneous	24	0.79		
Nonmetallic Mines	8	0.26		

	Non-backdating firms		Backdating firms	
Industry	# of firms	Percent	# of firms	Percent
Personal Services	29	0.95	9	1.9
Petroleum and Natural Gas	104	3.41	12	2.54
Pharmaceutical Products	168	5.5	35	7.4
Precious Metals	5	0.16		
Printing and Publishing	25	0.82		
Real Estate	25	0.82		
Recreational Products	29	0.95	3	0.63
Restaurants, Hotel, Motel	62	2.03	7	1.48
Retail	122	4	23	4.86
Rubber and Plastic Products	34	1.11		
Shipbuilding, Railroad Eq	9	0.29		
Shipping Containers	6	0.2		
Steel Works, Etc.	47	1.54		
Telecommunications	83	2.72	16	3.38
Textiles	14	0.46	1	0.21
Tobacco Products	3	0.1		
Trading	160	5.24	8	1.69
Transportation	68	2.23	9	1.9
Utilities	111	3.64	3	0.63
Wholesale	114	3.74	19	4.02
Total	3,052	100	473	100

*, **, and *** denote two-tailed significance levels of 10%, 5%, and 1%, respectively, for differences between non-backdating firms and previous backdating firms.

Table 3.3 Return reversal around option grant dates

Raw (abnormal) return reversal is measured as the Buy-and-hold (Abnormal) Return 20 days after the grant minus the Buy-and-hold (Abnormal) Return 20 days before the grant. A firm is categorized as a "backdating firm" if it backdated over 50% of its option grants to top executives during the period of 1998-2002 and "non-backdating firm" if it backdated none of its option grants to top executives during the period of 1998-2002. A "backdated option grant" is one which has a >10% negative Buy-and-Hold return in the 20-day period prior to the reported grant date, followed by a >10% positive Buy-and-Hold return in the 20-day period following the reported grant date. Volatility is measured as the standard deviation of daily stock returns 50-70 trading days after the grant date.

Panel A. Return reversals around option grant dates, full sample, Post-SOX vs. Pre-SOX

	Raw Return		Abnormal Return	
	Pre-SOX	Post-SOX	Pre-SOX	Post-SOX
Max	7.449	5.869	7.533	5.855
Q3	0.191	0.110	0.182	0.099
Median	0.036	0.012	0.038	0.011
Mean	0.078	0.027	0.074	0.023
Q1	-0.083	-0.073	-0.078	-0.068
Min	-3.300	-1.500	-3.265	-1.556
N	12,927	8,292	12,927	8,292

Panel B. Post-SOX return reversals, Non-backdating firms vs. Previous backdating firms

Non-backdating firms, Post-SOX					
	N	Mean	Std. Dev.	Min	Max
Raw	5255	0.021	0.195	-1.500	2.564
AR	5255	0.018	0.187	-1.556	2.500
Previous Backdating firms, Post-SOX					
	N	Mean	Std. Dev.	Min	Max
Raw	705	0.055***	0.272	-1.399	2.579
AR	705	0.050***	0.261	-1.372	2.563

Panel C. Regress Post-SOX return reversals on Backdater indicator and control for firm volatility

	Raw Return			Abnormal return		
Variable	Coef.	t		Coef.	t	
Intercept	-0.003	-0.72		-0.005	-1.18	
Backdater	0.021	2.54	**	0.021	2.61	***
Volatility	1.047	7.46	***	0.959	7.11	***
N	5,868				5,868	
Adj. R-sq	1.15%				1.07%	

*, **, and *** denote two-tailed significance levels of 10%, 5%, and 1%, respectively

Table 3.4 Post-SOX filing time (# of business days)

The following describes the filing time of CEO option grants in the post-SOX period. Filing time is measured as the number of business days between the option grant date and the SEC filing date. "Backdating firms" and "non-backdating firms" are as defined in Table 3.3.

	N	Median	Mean	Std Dev	Min	Max
Non-backdating firms	6,454	2	8.9	46.07	0	1,009
Previous backdating firms	873	2	11.4	46.33	0	697

		Non-backdating firms	Previous backdating firms
100%	Max	1,009	697
99%		217	223
95%		26	55
90%		5	11
75%	Q3	2	2
50%	Median	2	2
25%	Q1	1	1
10%		1	1
5%		1	1
1%		0	0
0%	Min	0	0

Table 3.5 Timing of option grants relative to corporate disclosures

Corporate disclosure refers to the Earnings Announcement or Management Forecast that is closest to the option grant date. Corporate disclosures are classified as Good News or Bad News based on the 3-day Cumulative Abnormal Return (CAR) around the disclosure date. An option grant is pre-news (post-news) if the grant date is within 30 days prior to (after) the corporate disclosure date. G stands for good news and B stands for bad news. Filing time is measured as the number of business days between the option grant date and the SEC filing date.

Panel A: Frequency of option grants around corporate disclosures

	Post-SOX option grants issued by previous backdating firms (Return reversal >= 10%)	Pre-SOX option grants backdated
	Pct	Pct
Pre_news_G	0.18	0.24
Post_news_G	0.13	0.09
Pre_news_B	0.10	0.10
Post_news_B	0.30	0.22
Chi-square stat.	20.96	153.09

Panel B: Filing time (# of business days) of those post-SOX firm-grants with large RET reversals

	Post-SOX option grants issued by previous backdating firms (Return reversal >= 10%)	Pre-SOX option grants backdated
Max	479	1,790
Q3	2	199
Median	2	82
Mean	12	122
Q1	2	28
Min	0	0

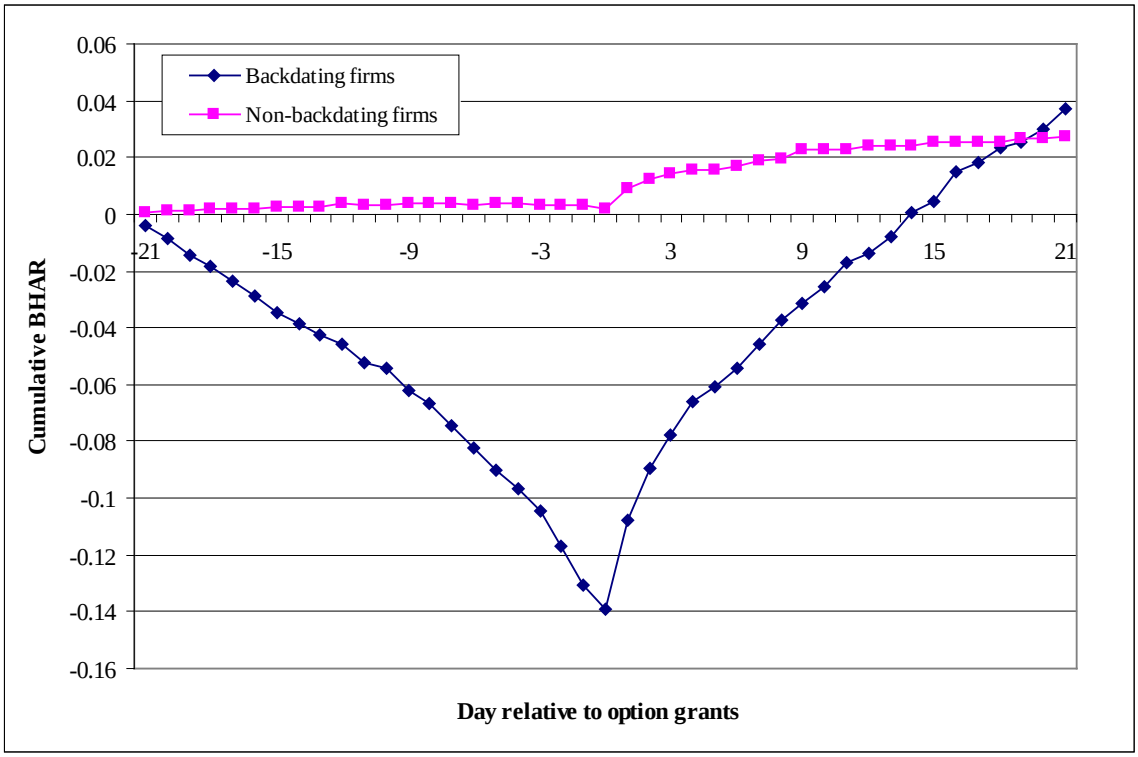
Panel C: Frequency of option grants around corporate disclosures, including only POST-SOX option grants that are reported within 2 business days

	Post-SOX option grants issued by previous backdating firms (Return reversal >= 10%)
	Pct
Pre_news_G	0.17
Post_news_G	0.12
Pre_news_B	0.08
Post_news_B	0.32
Chi-square stat.	22.95

Fig. 3.1 Cumulative buy-and-hold abnormal returns around option grants

This figure shows the cumulative abnormal returns from 20 days before through 20 days after stock option grants to CEOs. Abnormal stock returns are calculated as the difference between the buy-and-hold return of the firm and the buy-and-hold return of the market portfolio. Figure 1a depicts option grants issued in the pre-SOX period and figure 1b depicts option grants issued in the post-SOX period.

1a. Pre-SOX: backdating firms vs. non-backdating firms



1b. Post-SOX: previous backdating firms vs. non-backdating firms

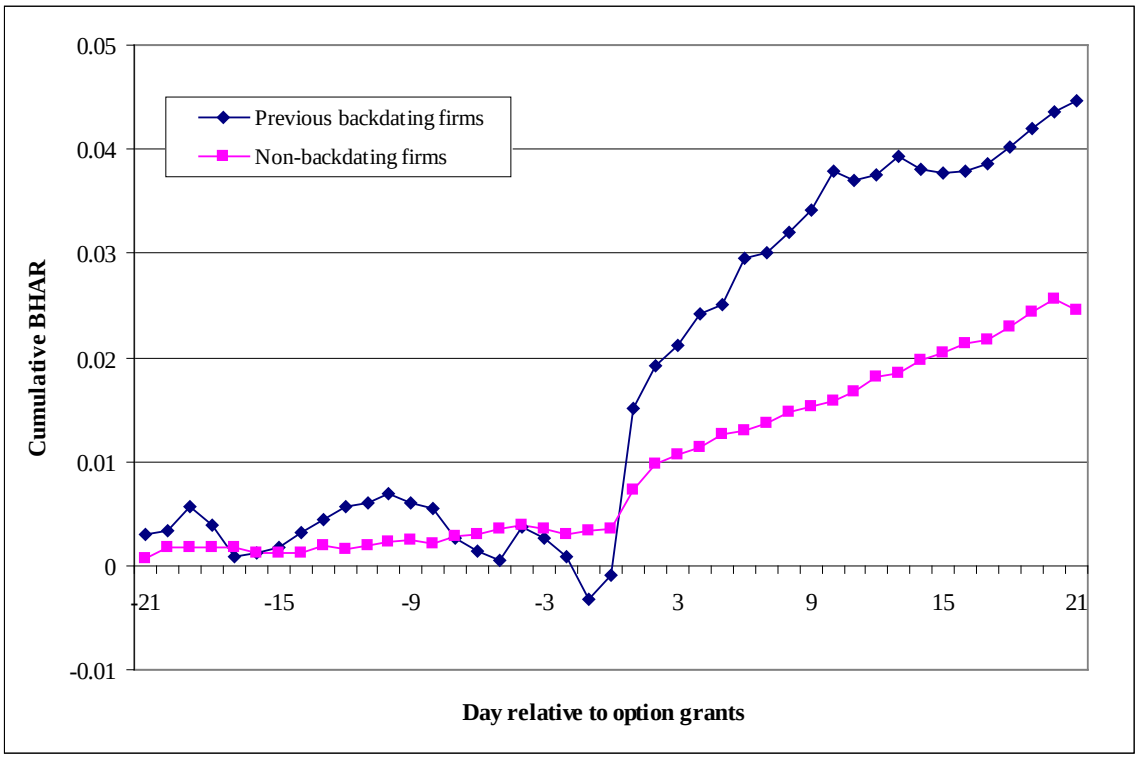


Fig. 3.2 Distribution of post-SOX filing time

The figure shows the distribution of the number of business days between the transaction date and the SEC filing date for 7,327 stock option grants to CEOs from year 2003 to 2006. The dark bars correspond to 873 grants issued by previous backdating firms, and the light bars correspond to 6,454 grants issued by non-backdating firms.

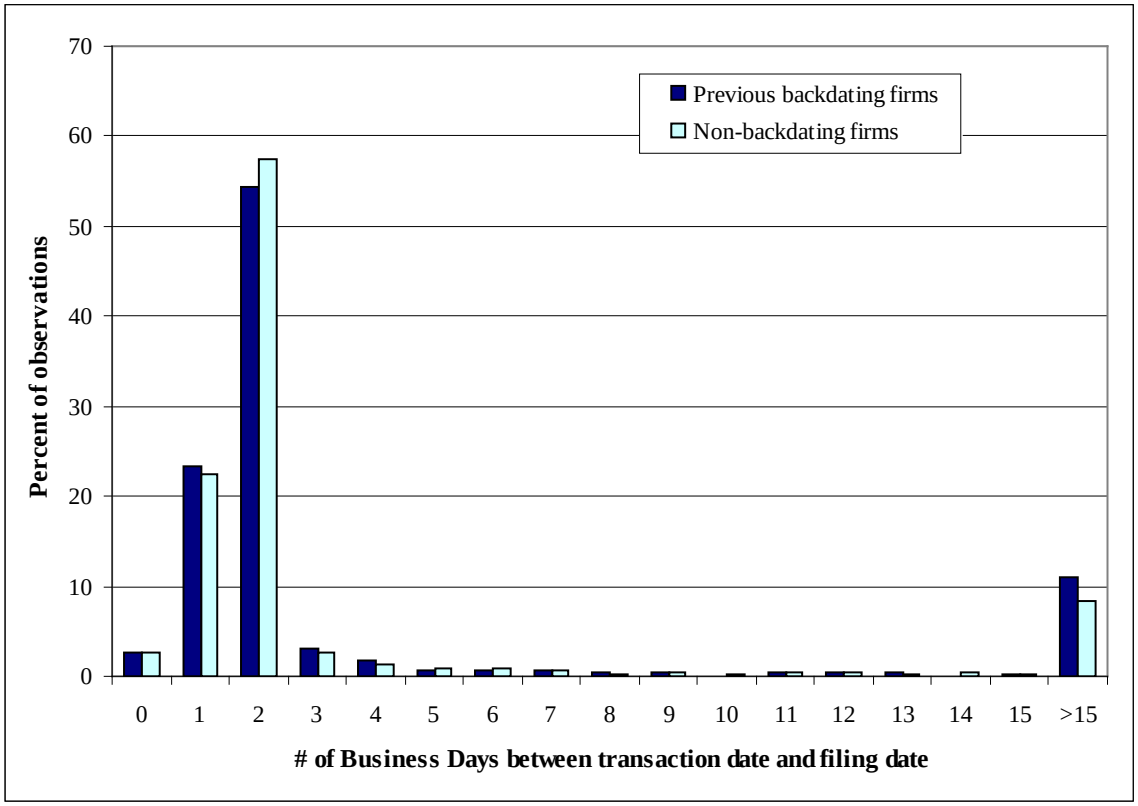
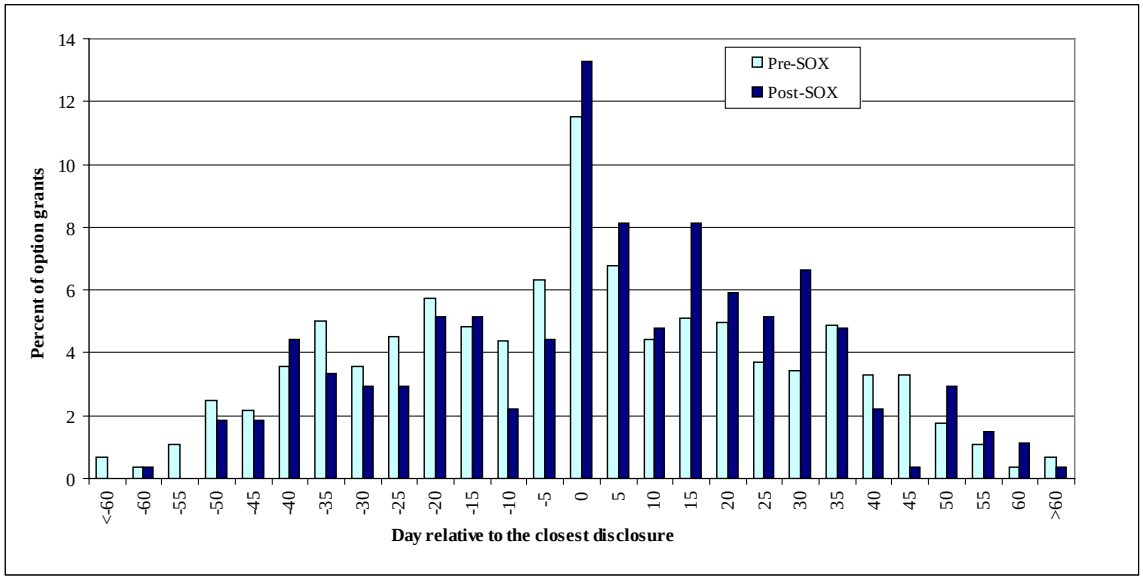


Fig. 3.3 Distribution of option grants around corporate disclosures

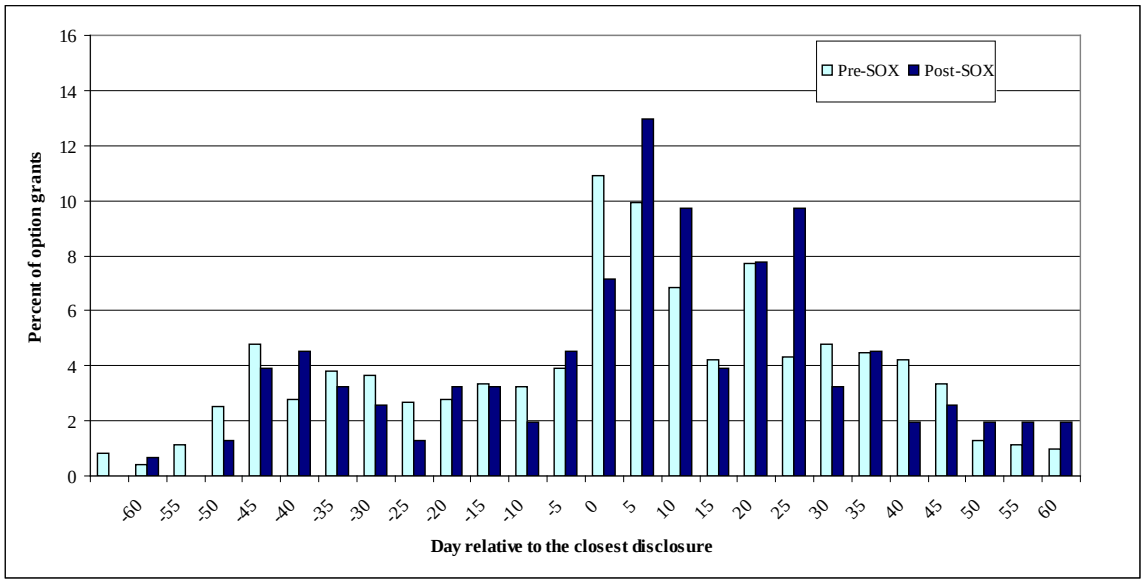
This figure shows the distribution of stock option grants to CEOs around corporate disclosures, defined as the Earnings Announcements or Management Forecasts closest to the option grant dates. Corporate disclosures are classified as Good News or Bad News based on the 3-day Cumulative Abnormal Return (CAR) around the disclosure date. The dark bars correspond to option grants that are backdated in the pre-SOX period by the previous backdating firms, and the light bars correspond to option grants that are issued by previous backdating firms in the post-SOX period and associated with abnormally large return reversals (>=10%).

3a: Distribution of option grants around **ALL** corporate disclosures: pre-SOX backdating cases compared with post-SOX large return reversal cases



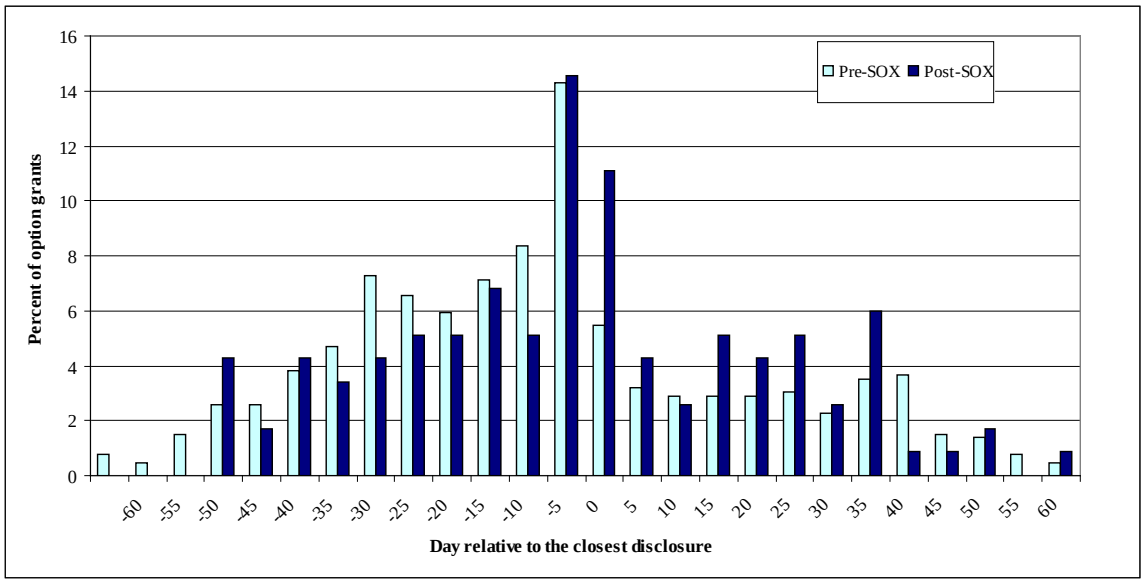
Numbers on X-axis correspond to the midpoints of each bin. The bin width is 5 business days.

3b: Distribution of option grants around **Bad-News** corporate disclosures: pre-SOX backdating cases compared with post-SOX large return reversal cases



Numbers on X-axis correspond to the start points of each bin (end points of the preceding bins). The bin width is 5 business days.

3c: Distribution of option grants around **Good-News** corporate disclosures: pre-SOX backdating cases compared with post-SOX large return reversal cases



Numbers on X-axis correspond to the start points of each bin (end points of the preceding bins). The bin width is 5 business days.

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Chapter 4—Conclusion

This thesis investigates two topics in executive compensation area. The first essay provides insights into boards' efficiency in using private information to compensation CEOs. It extends the literature through examining the board's role in another dimension of compensation efficiency: the use of privately observed performance measures in addition to publicly available ones. Second, this paper furthers research on corporate boards by examining the balance between its information role and its monitoring role. Prior research largely emphasizes the latter, whereas the capability of the board to obtain high quality information about the firm has been overlooked until very recent (e.g. Adams and Ferreira, 2007). Third, this paper relies on the relatively weak assumption that using private (in addition to public) information in compensation is efficient and complements studies examining board efficiency.

One caveat of this paper is that both compensation contract and board structure are endogenous, thus the relation found between them might be a spurious one driven by underlying economic characteristics (Hermalin and Weisbach, 2003). I am able to alleviate this problem by controlling for volatility of the firm performance as it is the factor that could both affect executive compensation and correlate with board structures. To fully address the endogeneity issue, future research could utilize a setting where change in board structures is exogenous (e.g. mandatory) and study the change in executive compensation that follows.

The second essay sheds light on the post-SOX behavior of previous backdating firms. Several recent studies have examined the effect of SOX on the timing of executive option grants (e.g. Collins et al., 2005; Huang and Lu, 2008; Narayanan and Seyhun, 2005). Compared to existing research, this paper studies the consequences of SOX 403 from a unique perspective that management opportunism may persist in spite of the regulation. The research design of this

paper allows a comparison across two groups of firms and provides evidence that former backdaters engaged in strategic timing to a greater extent relative to non-backdaters in the post-SOX period.

One caveat of this paper is that both backdating and proactive timing are inferred, as in prior literature, from the pattern of stock returns around option grants. A natural question to ask is to what extent this measure captures innate firm characteristics rather than opportunistic behavior of the top management. In future research, I plan to refine this measure by predicting a normal level of return reversal based on economic factors such as firm size and investment opportunities – the abnormal portion of return reversal would more likely be attributed to opportunistic timing behavior.

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Appendix

This section illustrates the rationale of using the relation between future performance and residual compensation to measure the extent to which private information has been incorporated into the compensation contract.

Suppose that CEO compensation depends on three factors: the publicly observable performance measure ($y_{pub,t}$), the performance measure privately observed by the board of directors ($y_{pri,t}$), and other factors that are orthogonal to current and future performance ($y_{other,t}$):

$$comp_t = \gamma_0 + \gamma_1 y_{pub,t} + \gamma_2 y_{pri,t} + \gamma_3 y_{other,t}$$

Note that $y_{pub,t}$ and $y_{pri,t}$ are allowed to be potentially correlated whereas $y_{other,t}$ is independent of both $y_{pub,t}$ and $y_{pri,t}$.

Define res_comp_t (referred to as 'unexplained compensation' later) as CEO compensation net of the expectation of CEO compensation given current public performance measure.

$$\begin{aligned} res\_comp_t &= comp_t - E[comp_t \mid y_{pub,t}] \\ &= \gamma_0 + \gamma_1 y_{pub,t} + \gamma_2 y_{pri,t} + \gamma_3 y_{other,t} - \{\gamma_0 + \gamma_1 y_{pub,t} + \gamma_2 E[y_{pri,t} \mid y_{pub,t}] + \gamma_3 E[y_{other,t}]\} \\ &= \gamma_2 \{y_{pri,t} - E[y_{pri,t} \mid y_{pub,t}]\} + \gamma_3 \{y_{other,t} - E[y_{other,t}]\} \end{aligned}$$

As manifested in the above expression, the unexplained compensation contains both private information of the board and other factors orthogonal to firm performance. The private information resolves noise in public performance measures about CEO actions, the effect of which cannot be entirely reflected by the current period firm performance but can be revealed in a future period. Therefore, the private information can be regarded as a noisy presentation of CEO actions (a_t) that affect future firm performance ($y_{pub,t+1}$):

$$y_{pri,t} = a_t + \varepsilon$$

$$Corr(y_{pub,t+1}, y_{pri,t}) = Corr(y_{pub,t+1}, a_t)$$

Without loss of generosity, I assume this correlation is positive (i.e., a_t is desirable).

Therefore, if CEO compensation contains private information, there should be a positive correlation between future performance and current unexplained compensation, which can be expressed as:

$$\begin{aligned} &Corr(y_{pub,t+1}, res\_comp_t) \\ &= Corr(y_{pub,t+1}, \gamma_2 \{y_{pri,t} - E[y_{pri,t} \mid y_{pub,t}]\} + \gamma_3 \{y_{other,t} - E[y_{other,t}]\}) \\ &= Corr(y_{pub,t+1}, \gamma_2 \{y_{pri,t} - E[y_{pri,t} \mid y_{pub,t}]\}) = \gamma_2 Corr(y_{pub,t+1}, y_{pri,t}) \end{aligned}$$

$Corr(y_{pub,t+1}, res\_comp_t)$ is an increasing function of γ_2. That is, this correlation will be stronger when the private signal receives higher weight in the optimal contract.