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AN EMPIRICAL ANALYSIS OF THE DYNAMIC RELATION BETWEEN A CEO'S MULTIPLE PERFORMANCE MEASURE COMPENSATION CONTRACT AND THE HORIZON PROBLEM

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by

Christine Cheng

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ABSTRACT

Two streams of agency theory research have focused on different aspects of the contracting relationship between shareholders and CEOs. The first stream of agency theory research examines the role of multiple performance measures in a CEO's compensation contract in maximizing firm value in a single-period setting. The second stream of agency theory research focuses on the horizon problem and examines how a CEO's career concerns, his desire to remain employed or cease employment in the near future, affect his utility and his compensation contract. Both streams of research provide useful evidence on the shareholder-CEO contracting relationship but are incomplete because they do not simultaneously consider multiple performance measure, multi-period compensation contracting.

The second chapter of this dissertation examines multiple performance measures in the presence of the horizon problem to determine whether a CEO's compensation structure, the ratio of earnings-based compensation to total compensation, is affected by the CEO's career concerns. In examining whether the CEO's compensation contract is affected by his career concerns, I recognize that a CEO who is nearing retirement can leave the firm for a variety of reasons. As such, I use a competing risks regression, a hazard model that allows for the comparison between observation groups by how the CEO left the firm, to incorporate the reason a CEO left into the analysis of the relation between a CEO's compensation structure and his tenure. The three groups of interest in the competing-risks regression are whether the CEO retired, resigned following poor

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performance, or left following a merger or acquisition. I find no evidence that a CEO's tenure for each of these groups is associated with his compensation structure. I also do not find evidence of significant differences between the compensation structures of CEOs who retired, resigned following poor performance, or left following a merger or acquisition. The lack of associations and differences between compensation structures does not offer insight into whether compensation committees adjust compensation contracts to offset a CEO's career concerns as he gets ready to leave the firm but do suggest that, if the compensation structure is being adjusted, it is done in a manner that assumes all CEOs will leave for the same reason. I do find evidence that a CEO's tenure is associated with firm performance for both the retirement and poor-performance groups. This suggests that the board of directors actively monitors the CEO's performance.

I use the estimates of CEO tenure generated by the competing risks regression in a maximum-likelihood regression of the determinants of a CEO's compensation structure. I find that CEOs with more earnings-based compensation have longer tenures. This is consistent with the notion that CEOs who are approaching retirement are likely to become more conservative and unwind their equity positions. I also find that the relative noise ratio, the ratio of the noise in earnings to the noise in stock price, is positively associated with a CEO's compensation structure. This finding is contrary to prior theoretical and empirical research that examines the determinants of a CEO's compensation structure in a single-period setting, which predicts and finds evidence of a

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negative relation between a CEO's compensation structure and the relative noise ratio. In my research, I examine a multi-period setting. Certain features of a CEO's compensation structure, such as stock options, have been shown to encourage CEOs to increase volatility. Thus, in a multi-period setting, the relative noise ratio would have a positive relationwith a CEO's compensation structure.

While a CEO's compensation structure is not related to his tenure, changes in his compensation structure are related to his tenure for both the poor performance and the merger and acquisition groups. For the poor performance group, stock-based compensation increased with tenure. In addition, the changes in compensation structure for both the poor performance and retirement groups are similar. Finally, changes in performance are negatively associated with tenure for CEOs in the poor performance group. The combination of these results suggest that compensation committees increase stock-based compensation as CEOs approach retirement but not in a manner that suggests the compensation committee distinguishes between how a CEO will leave the firm. Instead, it appears that compensation committees allow firm performance to determine how a CEO, who is of retirement age, leaves the firm.

For the mergers and acquisition groups, increases in stock-based compensation are associated with shorter tenures. This is consistent with the notion that significant increases in stock-based compensation can motivate CEOs to find ways to unwind their equity positions as their career concerns change. Becoming a target of a merger or acquisition may afford the CEO such an

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opportunity. The changes in compensation structure for the mergers and acquisition group are significantly different than the changes in compensation structure of both the retirement and poor performance groups. While the changes in compensation structure for the mergers and acquisition group are significantly different from the retirement and poor performance groups, univariate statistics indicate that the changes in compensation structure for the mergers and acquisition group result in compensation structures that are similar to the retirement group's for the period immediately preceding when the CEO left the firm. Thus, the changes in compensation structure for the mergers and acquisition group also appears to support the notion that, while compensation committees appear to adjust a CEO's compensation structure as he approaches retirement, they do not do so in a manner that is indicative that they anticipate how a CEO will leave the firm.

A different method of examining the shareholder-CEO contracting relationship is to examine the sensitivity of a CEO's compensation to changes in shareholder's wealth. In the third chapter of this dissertation, I examine the shareholder-CEO contracting relationship in regard to the incentive ratio, which is the ratio of a measure of the sensitivity of changes in the CEO's earnings-based compensation contract to changes in shareholder wealth to a measure of the sensitivity of the CEO's stock-based compensation to changes in shareholder wealth. While the proxy for a CEO's incentive ratio is positively correlated with my proxy of the CEO's compensation structure, the correlation is not statistically

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significant, suggesting that these two measures capture different features of the shareholder-CEO contracting relationship.

While the empirical evidence in Chapter 2 does not indicate any association between a CEO's compensation structure and his tenure, the empirical evidence in Chapter 3 suggests a significant association between the CEO's incentive ratio and his tenure. For both the retirement and merger and acquisition groups, larger stock-based incentives are associated with shorter tenures. This is consistent with the notion that, as a CEO approaches retirement, he may become more conservative and wish to unwind his risky equity positions by leaving the firm. Interestingly, larger earnings-based incentives are associated with shorter tenures for the poor performance group. This is consistent with the notion that a compensation committee will force a resignation sooner for CEOs who have significant earnings-based incentives but are not realizing the expected performance targets. When the estimates of tenure from the competing risk regression are included in a maximum-likelihood regression that examines the determinants of the CEO's incentive ratio, I find a negative association between the CEO's tenure and his incentive ratio. This is consistent with the notion that stock-based incentives encourage the CEO to leave so that he can unwind his risky equity positions.

For the analysis of whether there is an association between changes in a CEO's incentive ratio and his tenure, I find that increases in stock-based incentives are associated with longer tenures for CEOs who leave following a merger or acquisition. This is inconsistent with the notion that increases in a

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CEO's stock-based incentives will motivate the CEO to shorten his tenure by engaging in a merger or acquisition. However, these results are consistent with the notion that increases in a CEO's stock-based incentives will motivate the CEO to engage in a merger or acquisition when it is favorable for the CEO to do so.

Overall, the results from both Chapter 2 and Chapter 3 suggest that compensation committees adjust compensation as a CEO moves through his tenure with a firm but not in a manner that suggests that the compensation committee anticipates how a CEO will leave the firm. However, the evidence also suggests that these adjustments, when coupled with firm performance, do affect how a CEO leaves the firm. These results may be of interest to shareholders, regulators, and researchers and aid our understanding of how a CEO's personal characteristics may affect the contracting relationship as he moves through his tenure with a firm.

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CHAPTER 1

Introduction

CEO compensation receives a significant amount of attention from the media, shareholders, government officials, and researchers. While the media, shareholders, and government officials typically focus on isolated cases of CEO compensation contracts, researches seek to gain an understanding of patterns in CEO compensation contracts and the effects of both conformity and deviations from typical patterns in CEO compensation contracts. One underexplored area of CEO compensation is an understanding of patterns in CEO compensation contracts as a CEO moves through his tenure with a firm and approaches retirement. This study seeks to contribute preliminary empirical evidence on patterns of CEO compensation contracts as a CEO moves through his tenure with a firm with a specific focus on the years immediately preceding his retirement.

In studying broad patterns of CEO compensation contracts, researchers often rely on agency theory to generate predictions regarding the contracting relationship between a CEO and the principals of the firm for whom he works. Agency theory begins with identification of the parties involved in the contracting relationship. In this study, there are three parties involved: the shareholders, the CEO, and the compensation committee. The shareholders, as the owners of the firm, make an initial investment in the firm and receive profit based on the value of the firm after all expenses have been paid. The shareholders are typically a diverse group that is incapable of efficiently maximizing firm value. As such, the shareholders hire a CEO who is a professional manager and requires payment in

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exchange for his services. A subset of the shareholders forms a compensation committee, which is tasked with maximizing the value of the firm net of the compensation paid to the CEO. In this study, I assume that the goals of the compensation committee and shareholders are aligned in that both seek to maximize the value of the firm. The CEO's objective is to maximize his utility, which is a function of his compensation and his personal characteristics, such as his effort cost and his desire to remain employed or cease employment in the future. Depending on the CEO's compensation contract and his personal characteristics, the CEO's actions may not align completely with the shareholder's interests. As such, the CEO's personal characteristics impose a constraint on the compensation committee's ability to maximize the value of the firm. This constrained maximization problem connects the CEO's compensation contract to his actions. The CEO's utility is a key component of the maximization problem. In this study, I rely on two streams of agency theory research to define the CEO's utility as a function of a multi-measure, multi-period compensation contract.

The first stream of agency theory research examines the horizon problem. This research introduces the notion of a CEO's career concerns or his incentive to remain employed so that he can receive future compensation. To facilitate this discussion, it is helpful to break a CEO's tenure into two stages, as shown in

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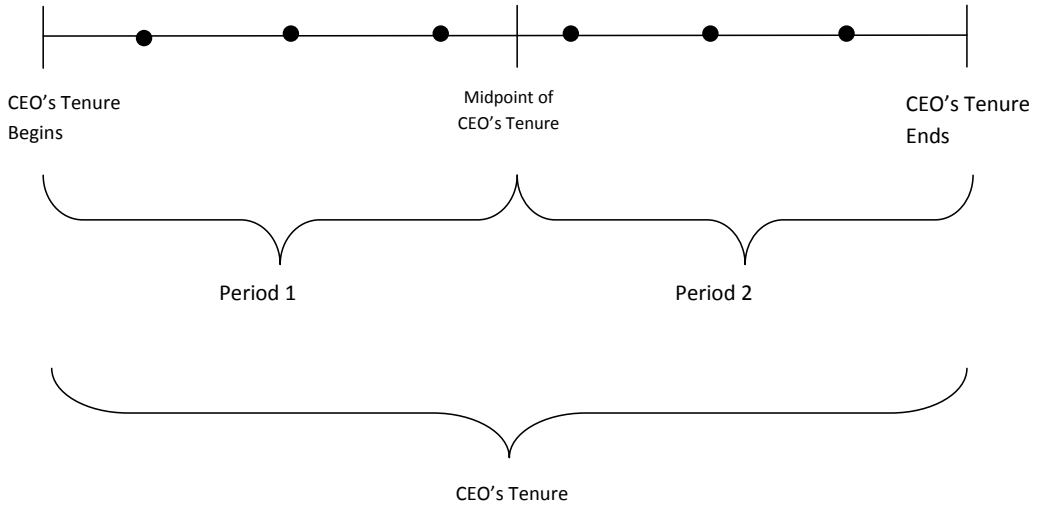
figure one below:

Figure 1: CEO's Tenure



The figure above depicts two distinct phases to the CEO's tenure. The CEO's tenure is defined as the time between the start of the first fiscal year in which the CEO is 58 years of age and the end of the last fiscal year that he is a CEO of that firm. If the CEO's tenure is longer than six years, the CEO's tenure is limited to the last six years preceding the CEO's departure from the firm.

Gibbons and Murphy's (1992) and Sabac's (2008) models of the horizon problem show that the CEO's utility in Period 1 is a function of his current-period compensation and his expectation that his effort in Period 1 will produce compensation benefits that will be received in Period 2. In Period 1, the CEO wants to remain employed so that he can receive compensation in Period 2; thus, his career concerns motivate him to take actions consistent with shareholder goals. Once a CEO leaves the firm, the compensation committee could pay the CEO, but, according to Sabac (2008), such post-employment pay is inefficient for the firm if no further productive effort is required. As a result, the CEO's career concerns wane in Period 2, and his utility becomes a function of his current-period compensation contract. Theoretic and empirical research on the horizon

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problem provides evidence that the CEO's career concerns affect both the CEO's actions and his compensation. Horizon problem research uses either the CEO's total compensation or isolated components of the CEO's compensation.

If a CEO's actions were directly observable, then a compensation committee could contract with the CEO based directly on his effort. In this case, the cheapest form of compensation, be it cash or stock, is used to compensate the CEO. Under this scenario, a single measure of compensation is appropriate.

However, a CEO's actions are not directly observable. As such, the compensation committee must design the compensation contract using publicly observable performance measures, such as stock price and earnings. Since both are affected by the CEO's actions, but are also affected by factors other than the CEO's actions, stock price and earnings provide imperfect, or noisy, measures of the CEO's performance. Demski (1997) suggests that a performance measure will only be included in a CEO's compensation contract if the performance measure provides information about the CEO's actions that is not contained in performance measures already being used in the compensation contract or if the performance measure reduces the noise of a performance measure already being used in the compensation contract. The observation of both stock-based and earnings-based compensation indicates that the information contained in stock price does not subsume the information provided by earnings for the purpose of efficient compensation contracting.

The second stream of agency theory research examines the determinants of a CEO's compensation structure, the relative weight placed on earnings-based to

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stock-based performance measures in a compensation contract, in a single-period setting. When multiple performance measures are present in the compensation contract, the CEO's actions affect his pay through both of the observable performance measures: earnings and stock price. In a multi-period setting, these multiple performance measures can interact both within a period and across periods. There is no clear indication from prior empirical or theoretic research in either the horizon problem setting or the compensation structure research whether a CEO's compensation structure changes as he moves through his tenure towards retirement. The relationship of interest is the effect of a CEO's actions in one period on current period and subsequent period performance measures. Given the lack of clear predictions about the effect of a CEO's actions in one period on current period and subsequent period performance measures, Chapter 2 of this study seeks to answer the empirical question of whether there are systematic patterns present in the CEO's compensation structure or compensation structure changes as the CEO approaches retirement.

Since agency theory research of CEO-shareholder contracting defines a relationship between the CEO's compensation contract and his incentives, an examination of the changes to a CEO's compensation contract as the CEO approaches retirement can aid our understanding of the CEO's incentives as he approaches retirement. While some empirical research finds evidence that CEOs engage in myopic behavior as the CEOs approach retirement, Cazier (2008) replicates an earlier study of the horizon problem and finds that, after controlling for performance, there is no evidence that CEOs engage in myopic behavior as

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they approach retirement.[1] Cazier (2008) may not have found evidence of the horizon problem because the weight assigned to a particular performance measure in the CEO's compensation contract; thus, the CEO's incentive ratio, the ratio of earnings-based incentives to stock-based incentives, is changed in a manner that increases the CEO's current period benefit from his actions and decreases his incentives to engage in myopic behavior. Chapter 3 of this study extends previous empirical research on the horizon problem and previous empirical research of the determinants of the CEO's compensation structure by examining whether the CEO's incentive ratio changes as the CEO approaches retirement.

The preceding discussion and previous empirical research of the horizon problem circumvents the endogeneity of the relationship between the CEO's compensation contract and his personal characteristics. I propose to expand upon previous research of the horizon problem by taking into account the endogeneity between the CEO's compensation contract and his personal characteristics with three research design elements: using a multi-year approach to analyze compensation contracts, the incorporation of the reason a CEO left the firm, and the use of a two-stage least squares estimation procedure. Larcker (2003a) notes that a typical CEO's compensation contract uses multi-year accounting-based performance plan. James Reda, a compensation consultant and owner of James F. Reda and Associates, confirmed the importance of these multi-year features in compensation contracts. James Reda noted that compensation contract negotiations are a long and costly process for both parties, and, as a result, while

[1] Dechow and Sloan (1994) find that CEO's incentives to reduce R&D expenditures are mitigated by the CEO's stock holdings immediately preceding the CEO's retirement. Cazier (2008) replicates the work conducted by Dechow and Sloan (1994).

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compensation contracts allow for CEO performance evaluation in each period, the compensation contract itself is typically thought of as a multi-year agreement.[2] Boschen and Smith's (1995) evidence that a CEO's pay responds to firm performance over several years provides further support for analyzing compensation using a multi-year approach. These observations suggest that an alternative to a cross-sectional analysis or analysis of time-series yearly changes in compensation is to use a multi-year approach to examining the CEO's compensation contract and changes to the CEO's compensation contract.

I incorporate a multi-year approach in my empirical analysis by averaging a CEO's compensation structure or incentive ratio over several years in each period as shown in Figure 1.

I also attempt to address the endogeneity inherent in the relationship between the CEO's compensation contract and his incentives by incorporating the reason why a CEO left the firm as a determinant of the compensation structure. While CEOs who retire comprise the single largest group of my sample, there are a variety of other reasons why a CEO may leave a firm, such as resignation following poor firm performance or departure following a merger or acquisition. The reason a CEO leaves the firm is likely to be a function of the CEO's incentives, as well as the performance of the firm. As such, I incorporate the reason a CEO left the firm in the analysis by using a competing risks model, a hazard model that allows comparison between groups based on the reason CEOs

[2] An estimate of the typical number of years considered by a compensation contract is 3 to 5-years. This estimate is based on observations from proxy statements that many compensation contract components, such as stock options and restricted stock vesting periods, as well as long-term incentive plans periods tend to be based on a 3 or 5-year vesting (performance) period.

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leave their firms. Further discussion of the competing risks model is provided in the research design section of Chapter 2 and in Appendix A.

Finally, I attempt to address the endogeneity inherent in the examination of the dynamic relationship between the CEO's compensation structure and his incentives as he approaches retirement by using a two-stage least squares estimation procedure.[3] An important assumption being made by the incorporation of the departure reason into the system of equations procedure is that the compensation committee anticipates and adjusts the CEO's compensation contract to motivate a CEO to leave in a particular manner. There is some empirical and anecdotal evidence that compensation committees anticipate and adjust CEOs' compensation contracts to motivate CEOs to retire, to encourage retention or turnover, and to motivate CEOs to leave following merger and acquisition activity. Sundaram and Yermack (2006) provide empirical evidence that compensation committees adjust a CEO's compensation contract to motivate the CEO to retire. Chen's (2004) evidence, which shows that firms who restrict repricing of underwater options are more vulnerable to voluntary CEO turnover, supports the notion that compensation committee choices regarding compensation affect a CEO's turnover or retention. Anecdotally, the presence of golden parachute provisions in CEO compensation contracts suggests that compensation committees motivate CEOs to accept mergers and acquisitions. Since the compensation committee's expectation of the CEO's departure reason is

[3] As pointed out by Larcker (2003b), the use of a two-stage least squares estimation does not eliminate the endogeneity but simply pushes the endogeneity to the second stage of the system of equations unless an instrumental variable can be identified. If my assumptions do not hold, then the system of equations may bias the coefficients.

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unobservable, the realization of the CEO's departure reason is used as a proxy for the expectation of the CEO's departure reason.

To empirically examine the relationship between the CEO's career concerns and his compensation structure, I gathered data for a randomly selected sample of 300 CEOs who left their firms when they were of retirement age, defined as 58 or older.

I begin my analysis by examining whether the compensation structure is determined by the relative noise of each performance measure, stock, and earnings. The relative noise of each performance measure is a theoretic concept. Both stock and earnings are affected by the CEO's actions but are also affected by other factors. The theoretical concept of noise is defined by the amount of impact other factors have on stock or earnings. Because I am unable to directly observe the effect of a CEO's effort on stock and earnings, I use an empirical proxy for the noise in earnings and the noise in stock price. This empirical proxy is generated by obtaining errors from regression equations used to predict a firm's earnings (stock returns). The relative noise is then defined as the ratio of the error terms from the two regression equations, creating an empirical proxy for the ratio of the noise in earnings to the noise in stock price. I find that the relative weight placed on earnings in a compensation structure is positively and significantly associated with the relative noise of earnings to the noise of stock returns. This analysis is conducted without consideration of a CEO's tenure with the firm or his eventual departure method.

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I then use a competing risks regression to analyze whether a CEO's tenure, grouped by the reason the CEO left, is associated with his compensation structure. The three groups of interest in the competing-risks regression are whether the CEO retired, resigned following poor performance, or left following a merger or acquisition. I find no evidence that a CEO's tenure for each of these groups is associated with his compensation structure. I also do not find evidence of significant differences between the compensation structures of CEOs who retired, resigned following poor performance, or left following a merger or acquisition. The lack of associations and differences between compensation structures do not offer insight into whether compensation committees adjust compensation contracts to offset a CEO's career concerns as he gets ready to leave the firm but do suggest that, if the compensation structure is being adjusted, it is done in a manner that assumes all CEOs will leave for the same reason. I do find evidence that a CEO's tenure is associated with firm performance for both the retirement and poor performance groups. This suggests that the board of directors actively monitor the CEO's performance.

I use the estimates of CEO tenure generated by the competing risks regression in a maximum-likelihood regression of the determinants of a CEO's compensation structure. I find that CEO's with more earnings-based compensation have longer tenures. This is consistent with the notion that CEOs who are approaching retirement are likely to become more conservative and unwind their equity positions. I also find that the relative noise ratio, the ratio of the noise in earnings to the noise in stock price, is positively associated with a

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CEO's compensation structure. This finding is contrary to prior theoretical and empirical research that examines the determinants of a CEO's compensation structure in a single-period setting, which predicts and finds evidence of a negative relation between a CEO's compensation structure and the relative noise ratio. In my research, I examine a multi-period setting. Certain features of a CEO's compensation structure, such as stock options, have been shown to encourage CEOs to increase volatility. Thus, in a multi-period setting, the relative noise ratio would have a positive relation with a CEO's compensation structure.

While a CEO's compensation structure is not related to his tenure, changes in his compensation structure are related to his tenure for both the poor performance and the merger and acquisition groups. For the poor performance group, stock-based compensation increased with tenure. In addition, the changes in compensation structure for both the poor performance and retirement groups are similar. Finally, changes in performance are negatively associated with tenure for CEOs in the poor performance group. The combination of these results suggest that compensation committees increase stock-based compensation as CEOs approach retirement but not in a manner that suggests that the compensation committee distinguishes between how a CEO will leave the firm. Instead, it appears that compensation committees allow firm performance to determine how a CEO, who is of retirement age, leaves the firm.

For the mergers and acquisition group, increases in stock-based compensation are associated with shorter tenures. This is consistent with the

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notion that significant increases in stock-based compensation can motivate a CEO to find ways to unwind their equity positions as their career concerns change. Becoming a target of a merger or acquisition may afford the CEOs such an opportunity. The changes in compensation structure for the mergers and acquisition group are significantly different than the changes in compensation structure of both the retirement and poor performance groups. While the changes in compensation structure for the mergers and acquisition group are significantly different from the retirement and poor performance groups, univariate statistics indicate that the changes in compensation structure for the mergers and acquisition group result in compensation structures that are similar between the mergers and acquisition group and the retirement groups for the period immediately preceding when the CEO left the firm. Thus, the changes in compensation structure for the mergers and acquisition group also appears to support the notion that, while compensation committees appear to adjust a CEO's compensation structure as he approaches retirement, they do not do so in a manner that is indicative that they anticipate how a CEO will leave the firm.

A different method of examining the shareholder-CEO contracting relationship is to examine the sensitivity of a CEO's compensation to changes in shareholder's wealth. In the third chapter of this dissertation, I examine the shareholder-CEO contracting relationship in regard to the incentive ratio, or the ratio of a measure of the sensitivity of changes in the CEO's earnings-based compensation contract to changes in shareholder wealth to a measure of the sensitivity of the CEO's stock-based compensation to changes in shareholder

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wealth. While the proxy for a CEO's incentive ratio is positively correlated with my proxy of the CEO's compensation structure, the correlation is not statistically significant, suggesting that these two measures capture different features of the shareholder-CEO contracting relationship.

While the empirical evidence in Chapter 2 did not indicate any association between a CEO's compensation structure and his tenure, the empirical evidence in Chapter 3 suggests a significant association between the CEO's incentive ratio and his compensation structure. For both the retirement and merger and acquisition groups, larger stock-based incentives are associated with shorter tenures. This is consistent with the notion that, as a CEO approaches retirement, he may become more conservative and wish to unwind his risky equity positions by leaving the firm. Interestingly, larger earnings-based incentives are associated with shorter tenures for the poor-performance group. This is consistent with the notion that a compensation committee will force a resignation sooner for CEOs who have significant earnings-based incentives but are not realizing the expected performance targets. When the estimates of tenure from the competing risk regression are included in a maximum-likelihood regression that examines the determinants of the CEO's incentive ratio, I find a negative association between the CEO's tenure and his incentive ratio. This is consistent with the notion that stock-based incentives encourage the CEO to leave so that he can unwind his risky equity positions.

For the analysis of whether there is an association between changes in a CEO's incentive ratio and his tenure, I find that increases in stock-based

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incentives are associated with longer tenures for CEOs who leave following a merger or acquisition. This is inconsistent with the notion that increases in a CEO's stock-based incentives will motivate the CEO to shorten his tenure by engaging in a merger or acquisition. However, these results are consistent with the notion that increases in a CEO's stock-based incentives will motivate the CEO to engage in a merger or acquisition when it is favorable for the CEO to do so.

Overall, the results from both chapters suggest that compensation committees adjust compensation as a CEO moves through his tenure with a firm but not in a manner that suggests that the compensation committee anticipates how a CEO will leave the firm. However, the evidence also suggests that these adjustments, when coupled with firm performance, do affect how a CEO leaves the firm. These results may be of interest to shareholders, regulators, and researchers and aid our understanding of how a CEO's personal characteristics may affect the contracting relationship as he moves through his tenure with a firm.

Chapter 2 addresses the first research objective of empirically evaluating the relationship of the CEO's compensation structure and his career concerns as he approaches retirement. Section 2.1 introduces the problem and discusses the relevant literature. Section 2.2 describes the sample selection and provides some descriptive statistics. Section 2.3 explains the research design. Section 2.4 provides the main empirical results. Section 2.5 concludes the chapter.

Chapter 3 addresses the second research objective of empirically evaluating the relationship between the CEO's incentive ratio as he approaches retirement.

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Section 3.1 introduces the problem and discusses the relevant literature. Section 3.2 describes the sample selection and provides some descriptive statistics. Section 3.3 explains the research design. Section 3.4 provides the main empirical results. Section 3.5 concludes the chapter. Chapter 4 develops overall conclusions and highlights avenues for future research.

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CHAPTER 2

An Empirical Analysis of the Relation Between a CEO's Compensation Structure and His Career Concerns

2.1 Introduction

Extant research has suggested two personal characteristics, risk aversion and career concerns, that change a CEO's utility as he approaches retirement. Smith and Watts (1982) suggest that the CEO's risk aversion will increase as he approaches retirement. While the CEO's risk aversion is unobservable, the CEO's compensation contract may adjust to changes in his risk attitude. Thus, the compensation contract can be interpreted as reflecting changes in the CEO's risk aversion. Smith and Watts's (1982) suggestion is consistent with research results based on individual investor behavior, which suggests that individuals become more conservative as they approach retirement. James Reda, owner of a compensation consulting firm, states that CEOs may not become more conservative as they approach retirement but instead will continue to seek wealth maximization as the CEO approaches retirement. There is no empirical evidence as to whether a CEO's risk aversion changes as he approaches retirement; thus, it is unclear whether any changes to a CEO's risk aversion result in an observed change to his compensation package as he approaches retirement.

As discussed in Chapter 1, horizon problem research focuses on how career concerns can change a CEO's utility as he approaches retirement. Compensation committees should anticipate typical changes in risk aversion or career concerns and adjust the compensation contract to offset these changes. Extant research of the horizon problem treats the CEO's compensation contract as if it were

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comprised of a single performance measure by using either total compensation or a component of compensation. A glance at SEC mandated compensation disclosures reveals the universal presence of multiple performance measure compensation contracts. Agency theory research suggests that a performance measure will only be included in a compensation contract if it provides information about the CEO's actions, or if it reduces the noise in another performance measure. Therefore, the presence of multiple-performance measures in a CEO's compensation contract, even as a CEO approaches retirement, suggests that both performance measures help the compensation committee maximize the firm's value. Agency theory research has examined the determinants of the weight placed on each performance measure in a single-period setting.

Given the prediction from horizon problem research that a CEO's career concerns affect his utility as he approaches retirement, it is interesting to ask whether the weights placed on the two performance measures change as CEOs approach retirement. Chapter 2 seeks to answer this interesting question and extends both the horizon problem research and agency theory research by examining the determinants of levels and changes in a CEO's compensation structure as he approaches retirement.

The rest of this chapter is organized as follows. Section 2.2 identifies the sample selection and presents descriptive statistics. Section 2.3 develops the research design. Section 2.4 presents the empirical results and Section 2.5 concludes.

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2.2 Sample Selection and Descriptive Statistics

I begin by identifying all CEOs in the Execucomp database from 1992 to 2005. Execucomp starts tracking CEO compensation in 1992. My ending date is limited by the significant shift in CEO compensation disclosure requirements effective for companies whose fiscal year ended on or after December 15, 2006. These new disclosure requirements expanded the definitions of compensation previously provided in SEC Form DEF-14A. The expanded disclosure requirements make it difficult to disentangle changes resulting from new reporting requirements and changes resulting from terminal periods. As such, I elect to end the sample prior to the reporting requirement changes for that firm.

This study identifies CEOs who were retirement age. I follow tax law, which permits an individual to make penalty-free withdrawals from his retirement plans starting at age 59 ½, and identify the youngest age at which a CEO can retire as 59. In order to examine a CEO's compensation structure as he moves through his tenure with a firm, I require one observation per period. Therefore, I restrict a CEO's tenure to annual observations where the CEO is the CEO of the firm and is at least 58 years old.

In this study, I assume that the compensation committee is able to anticipate the CEO's departure and adjust the compensation structure in anticipation of the CEO's departure. Larcker's (2003b) observation that a CEO's compensation has multi-year features suggests that changes to a CEO's compensation will not be captured by measuring changes between a single period when multiple periods are available. I define each period to have a maximum of three years based on the

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observation that typical performance goals for long-term compensation plans and stock options vesting schedules are set over a three-year period. This limits the CEO's tenure to be a total of six years, with the sixth year being the year the CEO leaves the firm.

There were 2,367 CEOs in Execucomp who left the firm prior to December 15, 2006 , were above the age of 58 at the time they left the firm, and had been CEO for at least one year prior to leaving the firm. The date the CEO left the firm was unavailable for 980 of these observations. The following assumptions were made in such cases: the CEO left the firm on December 14, 2006 and an estimate of the CEO's age and his tenure were made based on the CEO leaving on December 14, 2006. A random sample of 300 of these CEOs was selected using the SAS random sample generator. If a CEO included in the sample was one of the CEOs for whom a missing date had been filled in, I collected the actual departure dates. When an observation was found ex post to not meet the sample criteria, I eliminated the observation from both the random sample and the population. The random sample generation procedure was used several times (without replacement) to obtain the initial sample of 300.

After identifying CEOs who could retire, I grouped CEOs based on the reason they left the firm. The first group of CEOs is those who left because of death or illness. I do not separate these two scenarios because, from a compensation committee standpoint, both of these events are likely to be unexpected; thus, there is no reason to expect that the compensation committee would adjust the compensation in anticipation of either of these events.

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The second group of CEOs is those who retired. To identify retirements I employ techniques similar to those suggested in the forced turnover literature. My initial sample of CEOs is already limited to CEOs who leave at retirement age, 59. I search various news sources using LexisNexis, Google, and Edgar filings, and classify a CEO as retiring if the retirement was pre-announced at least six months prior to the actual retirement date or the media reports surrounding the retirement date suggest that retirement was expected. I also use these sources to ensure that there is no indication that the retirement was forced, no mention of poor performance as a potential motivating factor, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate around the same time the CEO retired. Finally, I conduct a forward search to ensure that the CEO did not become a CEO at another firm within two years of his retirement from the firm in my sample. CEOs that joined another firm within the two-year time frame are lumped into a third group.

The fourth through seventh groups of CEOs are those who resigned. The fourth group consists of CEOs who resigned but no reason for the resignation is provided. I searched news reports and SEC filings to ensure that the departure was sudden or unexpected but did not report poor performance, manipulation or investigation, or disagreement as motivation for the resignation. The fifth group consists of CEOs who resigned and the announcement, or surrounding news reports, indicated the resignation was due to poor performance. The sixth group consists of CEOs who resigned and the announcement, or surrounding news

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reports, indicated the resignation was due to financial manipulation, SEC or other regulatory investigation, or followed the announcement of a class action or civil lawsuit in which the CEO was named as a defendant. The seventh group consists of CEOs who resigned and the announcement, or surrounding news reports, indicated that there was disagreement between the CEO and the board.

The eighth group consists of CEOs who left upon the consummation of, or within a year of the consummation of, a merger, an acquisition, or a spinoff transaction. The ninth group consists of CEOs who left immediately preceding a bankruptcy filing, during a bankruptcy filing, following the emergence of a firm from a bankruptcy filing, or the firm liquidated pursuant to a bankruptcy filing. The tenth group identified all CEOs whose reason for leaving did not fit in any of the preceding departure reason groupings.

Three main groups were used in the subsequent analysis: the retirement, poor performance, and mergers and acquisition groups. These groups were compared to each other, and also compared to the other seven categories in the competing risks analysis. This is discussed further in the research design section.

TABLE 2.1 VARIABLE DEFINITIONS

Salary	-	CEO's annual salary
Bonus	-	CEO's annual bonus
LTIP Payout	-	CEO's payout from a Long-Term Incentive Plan in the same year as the annual salary is reported
Other Annual Compensation	-	CEO's other annual compensation

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TABLE 2.1 VARIABLE DEFINITIONS (Continued)

All Other Compensation	-	CEO's other compensation (excludes Other Annual Compensation)
Present Value of Pension Benefits	-	Actuarial present value of the CEO's accumulated benefit under the pension plan, calculated using the following assumptions: - The discount rate is the risk-free rate of interest, defined by the seven-year T-Bill rate obtained from the Department of Treasury's website. - The retirement age is assumed to be the minimum retirement age suggested by the company or 65 if a minimum retirement age is not identified. - The annual benefits are estimated using the information provided in the proxy statement. - The probability that a CEO will receive a benefit in any given year is estimated using the CEO's current age and the Society of Actuaries Annuity 2000 Mortality Table. - If a surviving spouse benefit is indicated, the present value of the pension benefit is increased by 15%.
Earnings-based Compensation	-	Earnings-based compensation is the sum of Salary, Bonus, LTIP Payouts that are indicated to be based on earnings targets (this is the default assumption when no indication of performance target is provided in the proxy statement), Present Value of Pension Benefits, Other Annual Compensation, and All Other Compensation (which excludes Other Annual Compensation)
Value of Restricted Stock Held	-	As reported. If there is no indication of value provided, the number of outstanding restricted stock shares held at the end of the year is multiplied by the fiscal-year closing stock price.
Value of Stock Holdings	-	The number of shares beneficially owned (excluding options and restricted stock holdings) held at the end of the year multiplied by the fiscal-year closing stock price.

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TABLE 2.1 VARIABLE DEFINITIONS (Continued)

Value of Stock Option Grants	-	The Merton (1973) adjusted Black-Scholes call option value is calculated using the following assumptions: - The discount rate is the risk-free rate of interest, defined by the seven-year T-Bill rate obtained from the Department of Treasury's website. - The volatility is a historical sixty-month volatility of continuously compounded monthly returns. - The dividend yield is computed using the annualized dividend payment. - The stock price is the closing stock price on the date of the grant. If there is no closing stock price for the date of the option grant given, it is assumed that the closing stock price is equivalent to the option grant's strike price. - The time to maturity is reduced to 70% of the stated time to maturity. When no maturity date is provided, the time to maturity is assumed to be 70% of 10 years.
	-	The exercise price is as reported
Value of In The Money Exercisable Options	-	As reported.
Value of In the Money Non-Exercisable Options	-	The value of In the Money Non-Exercisable options is assumed to be 50% of the reported value.
Total Annual Compensation	-	The sum of earnings-based compensation, the value of restricted stock, the value of stock held, the value of stock option grants, the value of in the money exercisable options, and the value of in the money non-exercisable options.
Compensation Structure	-	Earnings-based Compensation divided by Total Annual Compensation

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The main variable of interest is the CEO's compensation structure (*CS*). I define a CEO's compensation structure as the ratio of earnings-based compensation to total compensation. Earnings-based compensation is defined as the sum of salary, bonus, long-term incentive plan payouts, and the present value of the CEO's Supplemental Employee Retirement Pension (SERP) plan in a fiscal year.[4] Following Core, Guay and Verrecchia (2003), total compensation is defined as the earnings-based compensation, plus restricted stock and stock options holdings in that fiscal year, and the change in the value of the CEO's stock and option portfolio in that fiscal year.[5]

I present the mean compensation statistics in table 2.2A below. I also conduct univariate *t*-tests between the means of the three major categories of departures, retirements, resignation due to poor performance, and merger and acquisition activity. The results of the *t*-tests are discussed but not tabulated.

[4] Cazier (2008) and Kalyta (2009) make distinctions between pension plans that are explicitly tied to earnings by including both salary and bonus as base pay in the pension calculation and pension plans that only use salary as base pay in the pension calculation. Smith and Watts (1982) note that salaries vary based on previous earnings reports, which suggest that salary, and anything based on it, is affected by earnings. Given the link that salary is affected by earnings, I elect to include all SERP plans in the definition of earnings-based compensation.

[5] The appropriate measure for stock-based compensation could be either the granted value of options and restricted stock given to the CEO or the present value of exercisable options, restricted stock and any other stock holdings the CEO has for his firm (calculated using Black Scholes valuation methods). Since this study is interested in the incentives a CEO has as he approaches retirement, this definition should not be restricted to the compensation value of stock incentives, as measured by the granted value of options and restricted stock given to the CEO. Instead, the definition of stock incentives included in total compensation should be the estimated value of the stock held by the CEO including the present value of exercisable and unexercisable options and restricted stock held by the CEO by using the stock price listed for the last day of the fiscal year for which the compensation was paid.

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TABLE 2.2A

Mean Compensation Structure Variables

Reason for Departure	% of Sample	Execucomp Compensation Structure	DEF 14A Compensation Structure	Diff Between Execucomp Compensation Structure and DEF 14A Compensation Structure	DEF 14A Period 1 Compensation Structure	DEF 14A Period 2 Compensation Structure	Diff Between Period 1 and Period 2 Compensation Structure
Retirement	49%	61.00%	28.12%	32.49% ***	31.36%	28.61%	-2.75% **
Resigned - No Indication	2%	76.63%	37.28%	39.40% ***	35.23%	39.44%	4.22%
Resigned - Poor Performance	14%	58.52%	30.95%	26.03% ***	35.27%	31.33%	-3.94%
Resigned - Manipulation, SEC Investigation, Shareholder Lawsuit	3%	38.12%	11.00%	26.57% ***	11.78%	17.27%	5.49%
Merger, Acquisition, Spinoff	24%	57.62%	32.08%	25.17% ***	37.63%	34.27%	-3.35%
Bankruptcy	1%	68.31%	51.67%	14.90%	41.46%	57.26%	15.80% *
All (N = 1230)		59.94%	28.77%	30.62% ***	32.79%	30.27%	-2.53% **

Notes:

Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether there was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - No Indication - CEOs who departed the firm where there is no reason provided, but news reports surrounding the resignation indicate the departure was sudden or unexpected, and/or the SEC filings indicate the sudden termination of a multi-year employment arrangement, but there was no report of poor performance, manipulation or investigation, or disagreement surrounding the event.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Resigned - Manipulation, SEC Investigation, Shareholder Lawsuit - CEOs who departed the firm and the announcement or surrounding news reports indicated the departure was due to financial manipulation, SEC or other regulatory investigation, or the announcement of a class action or civil lawsuit in which the CEO was named as a defendant who personally benefited from transactions surrounding their departure dates.

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Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

Bankruptcy - CEOs who departed the firm immediately preceding a bankruptcy filing, during a bankruptcy filing, following the emergence of a firm from a bankruptcy filing, or the firm liquidated pursuant to a bankruptcy filing.

All - The total sample is comprised of 300 randomly selected CEOs from the Execucomp database who were CEOs from 1992 - 2005. The sample CEOs are all of retirement age, 59 or older, at the time they left the firm. The total sample contains 1,230 firm-year observations for the 300 CEOs.

% of Sample - The percentage of CEOs that left due to the identified departure reason.

Execucomp Compensation Structure - The ratio of Total_Curr/TDC1. **Total_Curr**, as defined by Execucomp is the annual salary plus the annual bonus pay received by the CEO in year t. **TDC1**, as defined by Execucomp, is the total annual compensation received by the CEO in year t and is comprised of the following: salary, bonus, other annual compensation, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other total.

DEF 14A Compensation Structure - The ratio of Earnings-Based Compensation/Total Annual Compensation. **Earnings-Based Compensation** is the sum of salary, bonus, long-term incentive payouts that are indicated to be based on earnings targets (this is the default assumption when no indication of performance target is provided in the proxy statement), the present value of pension benefits, other annual compensation, and all other compensation (which excludes other annual compensation).
Total Annual Compensation - The sum of earnings- based compensation, the value of restricted stock, the value of stock held, the value of stock option grants, the value of in the money exercisable options, and the value of in the money non-exercisable options. Additional definitions for each of the listed compensation components are provided in table 2.1.

Diff Between Execucomp Compensation Structure Mean and DEF 14A Compensation Structure Mean - This variable is Computed for each firm year observation and then mean difference is computed for each departure reason. The Difference is computed by subtracting the DEF 14A Compensation Structure from the Execucomp Compensation Structure.

Period 1 Compensation Structure - This variable is the average compensation structure for all firm year observations identified as Period 1 observations. Period 1 is identified as firm years that are equal to or less than the midpoint year of a CEO's tenure.

Period 2 Compensation Structure - This variable is the average compensation structure for all firm-year observations identified as Period 2 observations. Period 2 is identified as all firm years that are greater than the year identified as the midpoint of the CEO's tenure.

Diff Between Period 1 and Period 2 Compensation Structure Means - This variable is computed as the mean of the difference between the Period 1 and Period 2 compensation structures. The difference between the Period 1 and Period 2 compensation structures are computed for each CEO.

***, **, and * indicate that the difference between the two groups are significant at the 1, 5, and 10 percent levels in a two-tail test, respectively. I use the t-test for the mean.

The descriptive statistics in Table 2.2A indicate a number of interesting differences. The mean compensation structures obtained using the hand-collected compensation data from the DEF 14A statements indicate a much smaller proportion of the compensation package is devoted to earnings-based compensation when compared to the compensation structure obtained using Execucomp's available data (Total_Curr/TDC1). This is somewhat surprising

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given that the definition of earnings-based compensation used for the hand-collected compensation information is broader than the definition used by Execucomp for Total_Curr, which only includes salary and bonus. The difference between the two compensation structures could be due to the sample selection procedures, which limit the sample to older CEOs, with longer tenures, and thus more opportunity to accumulate stock holdings in the firm. The Execucomp measure of compensation structure does not capture stock holdings. Similar compensation structures can be developed from the hand-collected information, but, as indicated in several recent papers, non-uniform definitions for compensation factors are likely to affect the results obtained and inferences drawn from those results. *T*-tests (untabulated) indicate no significant differences between the sample means of the retirement, resignation due to poor performance, and merger and acquisition groups.

The weight placed on earnings-based compensation decreases as the CEO approaches retirement. This is consistent with the notion that stock-based compensation provides long-term incentives to the CEO, and thus are increased to offset short-term incentives generated by the CEO's diminishing career concerns as the CEO approaches retirement. This is also consistent with the notion that CEOs accumulate more stock as they continue through their tenure. There is no significant difference between the compensation structures in Period 1 and Period 2 for CEOs who resign due to poor performance or for CEOs who leave following merger and acquisition activity. The lack of change for CEOs who resign due to poor performance is consistent with the notion that goals of CEOs who desire to

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remain employed are aligned with shareholder goals; thus, there is no reason to expect a significant change in the CEO's compensation structure prior to his resignation. The lack of difference in CEO compensation structure for CEOs who depart following merger and acquisition activity is interesting because it is consistent with the interpretation that a CEO's personal incentives influence him to act differently as he moves through his tenure even though his compensation structure remained fairly consistent between the two periods. The weight placed on earnings-based compensation increases for CEOs who depart due to bankruptcy. This is consistent with the notion that stock-based compensation is inefficient for firms that are undergoing bankruptcy proceedings.

T-tests of the differences between the mean compensation structures of the samples indicate that CEOs who retire and CEOs who resign following poor performance have similar compensation structures. This is inconsistent with the notion that the CEO's compensation structure influences the way he leaves. CEOs who leave following a merger or acquisition have significantly more earnings-based compensation than CEOs who retire. This evidence is inconsistent with the notion that abnormally large stock holdings encourage CEOs in the merger and acquisition group to unwind their equity positions as they approach retirement by becoming a participant in a merger or acquisition.

T-tests indicate no significant differences between the Period 1 and Period 2 compensation structures or between changes in compensation structure for the retirement, poor performance, or merger and acquisition groups. The lack of differences in means is consistent with the notion that compensation committees

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plan for changes in a CEO's personal characteristics as the CEO moves through his tenure but not in a manner that would indicate that the compensation committee anticipates how a CEO will eventually leave the firm.

The median compensation statistics are presented in table 2.2B below.

TABLE 2.2B

Median Compensation Structure Variables

					DEF 14A			
Reason for Departure	Execucomp Compensation Structure	DEF 14A Compensation Structure	Diff Between Execucomp Compensation Structure and DEF 14A Compensation Structure		Period 1 Compensation Structure	Period 2 Compensation Structure	Diff Between Period 1 and Period 2 Compensation Structure	
Retirement	61.20%	20.07%	26.03%	***	25.84%	22.92%	0.01%	
Resigned - No Indication	95.60%	6.27%	30.48%	***	30.15%	38.71%	0.34%	
Resigned - Poor Performance	60.61%	22.16%	24.85%	***	27.29%	25.73%	-0.08%	
Resigned - Manipulation, SEC Investigation, Shareholder Lawsuit	31.83%	6.40%	21.69%	***	8.77%	8.94%	0.00%	
Merger, Acquisition, Spinoff	55.23%	24.89%	17.88%	***	35.61%	27.00%	-2.10%	**
Bankruptcy	90.23%	38.93%	2.74%		32.21%	41.07%	16.64%	
All (N = 1230)	59.63%	20.23%	24.75%	***	27.80%	23.56%	-0.02%	

Notes:

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Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether there was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - No Indication - CEOs who departed the firm where there is no reason provided, but news reports surrounding the resignation indicate the departure was sudden or unexpected, and/or the SEC filings indicate the sudden termination of a multi-year employment arrangement, but there was no report of poor performance, manipulation or investigation, or disagreement surrounding the event.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Resigned - Manipulation, SEC Investigation, Shareholder Lawsuit - CEOs who departed the firm and the announcement or surrounding news reports indicated the departure was due to financial manipulation, SEC or other regulatory investigation, or the announcement of a class action or civil lawsuit in which the CEO was named as a defendant who personally benefited from transactions surrounding their departure dates.

Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

Bankruptcy - CEOs who departed the firm immediately preceding a bankruptcy filing, during a bankruptcy filing, following the emergence of a firm from a bankruptcy filing, or the firm liquidated pursuant to a bankruptcy filing.

All - The total sample is comprised of 300 randomly selected CEOs from the Execucomp database who were CEOs from 1992 - 2005. The sample CEOs are all of retirement age, 59 or older, at the time they left the firm. The total sample contains 1,230 firm-year observations for the 300 CEOs.

% of Sample - The percentage of CEOs that left due to the identified departure reason.

Execucomp Compensation Structure - The ratio of Total_Curr/TDC1. **Total_Curr**, as defined by Execucomp is the annual salary plus the annual bonus pay received by the CEO in year t. **TDC1**, as defined by Execucomp, is the total annual compensation received by the CEO in year t and is comprised of the following: salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other total compensation.

DEF 14A Compensation Structure - The ratio of Earnings-Based Compensation/Total Annual Compensation. **Earnings-Based Compensation** is the sum of salary, bonus, long-term incentive payouts that are indicated to be based on earnings targets (this is the default assumption when no indication of performance target is provided in the proxy statement), the present value of pension benefits, other annual compensation, and all other compensation (which excludes other annual compensation). **Total Annual Compensation -** The sum of earnings-based compensation, the value of restricted stock, the value of stock held, the value of stock option grants, the value of in the money exercisable options, and the value of in the money non-exercisable options. Additional definitions for each of the listed compensation components are provided in table 2.1.

Diff Between Execucomp Compensation Structure Mean and DEF 14A Compensation Structure Mean - This variable is computed for each firm-year observation and then mean difference is computed for each departure reason. The Difference is computed by subtracting the DEF 14A Compensation Structure from the Execucomp Compensation Structure.

Period 1 Compensation Structure - This variable is the average compensation structure for all firm-year observations identified as Period 1 observations. Period 1 is identified as firm years that are equal to or less than the midpoint year of a CEO's tenure.

Period 2 Compensation Structure - This variable is the average compensation structure for all firm- year observations identified as Period 2 observations. Period 2 is identified as all firm-years that are greater than the year identified as the midpoint of the CEO's tenure.

Diff Between Period 1 and Period 2 Compensation Structure Means - This variable is computed as the mean of the difference between the Period 1 and Period 2 compensation structures. The difference between the Period 1 and Period 2 compensation structures are computed for each CEO.

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***, **, and * indicate that the difference between the two groups are significant at the 1, 5, and 10 percent levels in a two-tail test, respectively. I use the rank test for differences in medians.

The median compensation statistics also indicate significant differences between the compensation structure obtained using the hand-collected compensation data from the DEF 14A statements and the compensation structure generated from Execucomp. The hand-collected compensation structure indicates a much smaller proportion of the compensation package is devoted to earnings-based compensation when compared to the compensation structure obtained using Execucomp's available data (Total_Curr/TDC1). This is consistent with the previously proposed explanation that the sample selection criteria may have biased the sample toward CEOs who have more opportunity to accumulate stock holdings in their firm.

Unlike the mean statistics, the median statistics do not indicate any significant difference between Period 1 and Period 2 compensation structures for CEOs who retire. This is contrary to the notion that compensation committees change a CEO's compensation structure to offset personal characteristics as CEO's approach retirement. Instead, this suggests that a CEO's compensation structure is based on CEO or firm characteristics that remain stable over time. The median statistics indicate that the weight placed on earnings-based compensation decreases in the second period for CEOs who leave following a merger or acquisition. This increased emphasis on stock-based compensation could encourage CEOs to find ways to increase stock prices and allow them to unwind their equity positions by becoming a participant in a merger or

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acquisition. Further exploration of this phenomena is beyond the scope of this dissertation and is left to future research projects.

Statistical analysis of differences between the medians of various sample groups was conducted using the NPAIR1WAY procedure in SAS. The compensation structure medians for the groups of interest are similar. Untabulated analysis for medians also indicates no significant difference between the Period 1 and Period 2 compensation structures for CEOs who retire and CEOs who resign due to poor performance. This is consistent with the notion that the compensation structures were viewed as appropriately motivating CEOs as they approach retirement, and other factors, such as firm performance, influenced how the CEO left the firm. Untabulated analysis indicates that CEOs who retire have less earnings-based compensation than CEOs who leave surrounding a merger or acquisition in Period 1 but indicate no significant difference in Period 2. The statistical analysis of changes in compensation structure indicates that the decrease in earnings-based compensation for CEOs who leave surrounding a merger or acquisition moves the CEO's compensation structure closer to the Period 2 compensation structure of CEOs who retire. This evidence is consistent with the notion that compensation committees plan for changes in a CEO's personal characteristics as the CEO moves through his tenure but not in a manner that indicates that the compensation committee anticipates how the CEO will leave the firm.

The following two tables, Tables 2.2C and 2.2D, provide the non-compensation related descriptive statistics for the sample.

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Table 2.2C

Mean Control Variables

Reason for Departure	Age	Tenure	RELNOISE	LN(Sales)	ROA
Retirement	63	7.59	-0.03	7.33	0.11
Resigned - No Indication	61	6.22	0.18	6.95	0.16
Resigned - Poor Performance	63	7.52	-0.02	7.14	0.10
Resigned - Manipulation, SEC Investigation, Shareholder Lawsuit	65	9.65	-0.07	7.68	0.08
Merger, Acquisition, Spinoff	63	7.27	0.00	7.21	0.08
Bankruptcy	60	6.46	0.15	6.45	0.03
All (N = 1230)	63	7.69	-0.02	7.25	0.10

Notes:

Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether there was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - No Indication - CEOs who departed the firm where there is no reason provided but news reports surrounding the resignation indicate the departure was sudden or unexpected, and/or the SEC filings indicate the sudden termination of a multi-year employment arrangement, but there was no report of poor performance, manipulation or investigation, or disagreement surrounding the event.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Resigned - Manipulation, SEC Investigation, Shareholder Lawsuit - CEOs who departed the firm and the announcement or surrounding news reports indicated the departure was due to financial manipulation, SEC or other regulatory investigation, or the announcement of a class action or civil lawsuit in which the CEO was named as a defendant who personally benefited from transactions surrounding their departure dates.

Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

Bankruptcy - CEOs who departed the firm immediately preceding a bankruptcy filing, during a bankruptcy filing, following the emergence of a firm from a bankruptcy filing, or the firm liquidated pursuant to a bankruptcy filing.

All - The total sample is comprised of 300 randomly selected CEOs from the Execucomp database who were CEOs from 1992 - 2005. The sample CEOs are all of retirement age, 59 or older, at the time they left the firm. The total sample contains 1,230 firm-year observations for the 300 CEOs.

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Age - The age of a CEO in the year that the CEO departed the firm.

Tenure - The tenure of a CEO in years, computed as the difference between the date the CEO left his position as a CEO and the later of either the date the CEO became the CEO of the firm or the first day of the fiscal year in which the CEO was 58 years of age.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

ROA - Lagged return on assets.

Table 2.2D

Median Control Variables

Reason for Departure	Age	Tenure	RELNOISE	LN(Sales)	ROA
Retirement	62	6.55	-0.01	7.34	0.10
Resigned - No Indication	61	4.58	0.17	6.56	0.18
Resigned - Poor Performance	61	6.24	-0.02	7.18	0.08
Resigned - Manipulation, SEC Investigation, Shareholder Lawsuit	61	4.78	-0.01	7.36	0.05
Merger, Acquisition, Spinoff	61	6.01	0.00	7.13	0.07
Bankruptcy	60	5.75	0.03	6.86	0.03
All (N = 1230)	62	6.50	-0.01	7.26	0.09

Notes:

Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether there was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - No Indication - CEOs who departed the firm where there is no reason provided but news reports surrounding the resignation indicate the departure was sudden or unexpected, and/or the SEC filings indicate the sudden termination of a multi-year employment arrangement, but there was no report of poor performance, manipulation or investigation, or disagreement surrounding the event.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

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Resigned - Manipulation, SEC Investigation, Shareholder Lawsuit - CEOs who departed the firm and the announcement or surrounding news reports indicated the departure was due to financial manipulation, SEC or other regulatory investigation, or the announcement of a class action or civil lawsuit in which the CEO was named as a defendant who personally benefited from transactions surrounding their departure dates.

Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

Bankruptcy - CEOs who departed the firm immediately preceding a bankruptcy filing, during a bankruptcy filing, following the emergence of a firm from a bankruptcy filing, or the firm liquidated pursuant to a bankruptcy filing.

All - The total sample is comprised of 300 randomly selected CEOs from the Execucomp database who were CEOs from 1992 - 2005. The sample CEOs are all of retirement age, 59 or older, at the time they left the firm. The total sample contains 1,230 firm-year observations for the 300 CEOs.

Age - The age of a CEO in the year that the CEO departed the firm.

Tenure - The tenure of a CEO in years, computed as the difference between the date the CEO left his position as a CEO and the later of either the date the CEO became the CEO of the firm or the first day of the fiscal year in which the CEO was 58 years of age.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

ROA - Lagged return on assets.

Untabulated differences between the means and medians of each group indicate that the CEOs are similar in age, have similar tenures, come from similar-sized firms, and have similar relative noise ratios. CEOs who retire have higher return on assets than CEOs who resign following poor performance and CEOs who left following a merger or acquisition. When combined with the lack of difference in compensation structure, it appears that firm performance, not the CEO's compensation structure, influences how a CEO leaves the firm. Interestingly, CEOs who resigned following poor performance had higher return on assets than CEOs who left following a merger or acquisition. This may suggest that CEOs who realize significantly poor firm performance may leave their firms with little choice but to become the target of an acquisition.

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Tables 2.3 A through 2.3 C provide both Pearson and Spearman correlations for the retirement, poor performance, and merger and acquisition groups.

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Table 2.3 A

Pearson Correlation and Spearman Correlation For CEOs who left via Normal Retirement

		Spearman Correlation												
		Period 1 Compensation Structure (Mean)		Period 2 Compensation Structure (Mean)		Age		Tenure		RELNOISE	Ln(Sales)		ROA	
Pearson Correlation	Period 1 Compensation Structure (Mean)			0.9447	***	-0.2279	***	-0.2353		0.0860	-0.1419	**	-0.1813	**
	Period 2 Compensation Structure (Mean)	0.9378	***			-0.2434	***	-0.2039		0.1047	-0.1873	***	-0.2030	***
	Age	-0.2430	***	-0.2433	***			0.6443	***	-0.0511	-0.2396	***	-0.0277	
	Tenure	-0.2347		-0.2179		0.8584	***			0.0601	-0.2234		-0.0961	
	RELNOISE	0.1253	*	0.1135		-0.0662		0.1084			-0.0786		-0.0839	
	Ln(Sales)	-0.1705	**	-0.2091	***	-0.2660	***	-0.3200	**	0.0548			0.1005	
	ROA	-0.1525	**	-0.1442	**	-0.1228	*	-0.1661		0.0259	0.1076			

Notes:

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Normal Retirement - CEOs who retired from the firm. Retirement is identified by age, the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether theser was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the COE to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Period 1 Compensation Structure - This variable is the average compensation structure for all firm year observations identified as period 1 observations. Period 1 is identified as firm years that are equal to or less than the midpoint year of a CEO's tenure.

Period 2 Compensation Structure - This variable is the average compensation structure for all firm year observations identified as Period 2 observations. Period 2 is identified as firm years that are greater than the midpoint year of a CEO's tenure.

% of Sample - The percentage of CEOs that left due to the identified departure reason.

Age - The age of a CEO in the year that the CEO departed the firm.

Tenure - The tenure of a CEO in years, computed as the difference between the date the CEO left his position as a CEO and the later of either the date the CEO became the CEO of the firm or the first day of the fiscal year in which the CEO was 58 years of age.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

ROA - Lagged return on assets.

***, **, and * indicate that the correlation coefficient is significantly different from zero at the 1, 5, and 10 percent levels in a two-tail test, respectively.

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Table 2.3 B

Pearson Correlation and Spearman Correlation For CEOs who Resigned - Poor Performance

		Spearman Correlation											
		Period 1 Compensation Structure (Mean)		Period 2 Compensation Structure (Mean)		Age		Tenure	RELNOISE		Ln(Sales)		ROA	
Pearson Correlation	Period 1 Compensation Structure (Mean)			0.9677	***	-0.1361		-0.6669	-0.0204		-0.0615		-0.0452	
	Period 2 Compensation Structure (Mean)	0.9867	***			-0.0940		-0.6669	0.0137		-0.1269		-0.1144	
	Age	0.1317		0.1849				0.7255	-0.0822		-0.6268	***	-0.5867	**
	Tenure	-0.0212		-0.0878		0.9429			-0.4000		-0.6156		0.4000	
	RELNOISE	0.3092		0.3266		0.2791		0.2657			0.6000	**	-0.5121	**
	Ln(Sales)	-0.2183		-0.2810		-0.6339	***	-0.6357	0.1973				0.0330	
	ROA	-0.3247		-0.3560		-0.6182	**	0.1430	-0.5138	*	-0.0520			

Notes:

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Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Period 1 Compensation Structure - This variable is the average compensation structure for all firm year observations identified as period 1 observations. Period 1 is identified as firm years that are equal to or less than the midpoint year of a CEO's tenure.

Period 2 Compensation Structure - This variable is the average compensation structure for all firm year observations identified as Period 2 observations. Period 2 is identified as firm years that are greater than the midpoint year of a CEO's tenure.

% of Sample - The percentage of CEOs that left due to the identified departure reason.

Age - The age of a CEO in the year that the CEO departed the firm.

Tenure - The tenure of a CEO in years, computed as the difference between the date the CEO left his position as a CEO and the later of either the date the CEO became the CEO of the firm or the first day of the fiscal year in which the CEO was 58 years of age.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

ROA - Lagged return on assets.

***, **, and * indicate that the correlation coefficient is significantly different from zero at the 1, 5, and 10 percent levels in a two-tail test, respectively.

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Table 2.3 C

Pearson Correlation and Spearman Correlation For CEOs who left following a Merger, Acquisition, Spinoff

						Spearman Correlation									
		Period 1 Compensation Structure (Mean)		Period 2 Compensation Structure (Mean)		Age		Tenure		RELNOISE		Ln(Sales)		ROA	
Pearson Correlation	Period 1 Compensation Structure (Mean)			0.9613	***	-0.5251	***	-0.5022		-0.1504		-0.5484	***	0.4652	**
	Period 2 Compensation Structure (Mean)	0.8656	***			-0.5336	***	-0.6129	*	-0.1130		-0.5598	***	0.6002	***
	Age	-0.5348	***	-0.5185	***			0.8766	***	0.3612	**	-0.3065		-0.2841	
	Tenure	-0.4698		-0.4761		0.9936	***			0.0859		-0.2823		-0.6995	*
	RELNOISE	-0.0240		-0.1002		0.3526	*	0.3646				-0.0728		-0.1601	
	Ln(Sales)	-0.5507	***	-0.5321	***	-0.3115	*	-0.2748		-0.1586				-0.2197	
	ROA	0.2708		0.4256	**	-0.4374	**	-0.6595	**	-0.3659	**	-0.0962			

Notes:

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Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of a merger, and acquistion, or a spinoff transaction.

Period 1 Compensation Structure - This variable is the average compensation structure for all firm year observations identified as period 1 observations. Period 1 is identified as firm years that are equal to or less than the midpoint year of a CEO's tenure.

Period 2 Compensation Structure - This variable is the average compensation structure for all firm year observations identified as Period 2 observations. Period 2 is identified as firm years that are greater than the midpoint year of a CEO's tenure.

% of Sample - The percentage of CEOs that left due to the identified departure reason.

Age - The age of a CEO in the year that the CEO departed the firm.

Tenure - The tenure of a CEO in years, computed as the difference between the date the CEO left his position as a CEO and the later of either the date the CEO became the CEO of the firm or the first day of the fiscal year in which the CEO was 58 years of age.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

ROA - Lagged return on assets.

***, **, and * indicate that the correlation coefficient is significantly different from zero at the 1, 5, and 10 percent levels in a two-tail test, respectively.

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These correlation tables reveal that the compensation structure in Period 1 is positively correlated with the compensation structure in Period 2 for all three groups. This indicates that a CEO's compensation structure depends not just on the CEO's impending departure, but is also related to permanent CEO or firm characteristics, such as a CEO's preference for one type of compensation over another. For CEOs who retire and CEOs who leave after a merger or acquisition, tenure and age are negatively related to the compensation structure in both Period 1 and Period 2. The negative correlations between the CEO's age and the compensation structure, and the negative correlation between the CEO's tenure and the compensation structure, are consistent with the notion that older CEOs and CEOs with longer tenures have more opportunity to accumulate stock. There is a positive correlation between a CEO's tenure and the CEO's compensation structure for CEOs who resign following poor performance. CEOs who become more risk averse, but have larger amounts of stock-based compensation, may wish to terminate their tenure with the firm sooner than CEOs who have larger amounts of earnings-based compensation.

CEOs who retire have positive correlations between the relative noise ratio and compensation structures in Period 1 and Period 2. This positive correlation is inconsistent with prior empirical evidence and theoretical predictions. However, the focus on multi-period compensation structures in this study may effect the expected relationship between the relative noise ratio and compensation structure. Hanlon, Rajopal, and Shevlin (2003) show that stock options encourage CEOs to

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increase volatility. Thus, we might expect a positive association between the relative noise ratio and compensation structure in a multi-period setting.

The correlation tables reveal that larger firms are correlated with higher earnings-based compensation. This is consistent with the notion that smaller firms are more likely to conserve cash and thus use more stock-based compensation. Finally the correlation tables reveal a negative correlation between compensation structures and returns on assets, which suggests that better firm performance is associated with less earnings-based compensation. This negative correlation may be a function of tenure. CEOs who have better firm performance have longer tenures and thus have more opportunities to accumulate stock. I now turn my attention to multivariate analysis.

2.3 Research Design & Results

Banker and Datar (1989) develop a single-period model to characterize the determinants of a CEO's compensation structure. Banker and Datar (1989) provide evidence that the weight placed on a particular performance measure is directly proportional to the product of the sensitivity and the precision of that performance measure. The sensitivity of a performance measure is the amount the expected value of a performance measure changes in response to the CEO's action adjusted to remove the correlation of the two performance measures. Precision refers to the lack of noise in a performance measure. Despite the fact that neither the sensitivity or precision of a performance measure is directly observable, Sloan (1993) conducts cross-sectional tests of Banker and Datar's (1989) predictions using the variance of earnings and stock price and the

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covariance between earnings and stock price as empirical proxies of a performance measure's precision. The following formulation of the *RELNOISE*, variable, the proxy of the noise in earnings to the noise in stock price, is taken directly from Sloan (1993). I begin by estimating a regression for earnings and stock price. I estimate a firm's stock return by separating firm-specific and market-wide components through a time-series regression of stock returns, R_{it}, on market returns, R_{mt}:

$$R_{it} = \beta_{0i} + \beta_{1i} R_{mt} + s_{it}. \quad (1)$$

R_{it} denotes the stock return for firm *i* over period *t*, R_{mt} denotes the return on the CRSP value-weighted index over period *t*, and s_{it} represents the firm-specific 'signal' in the stock return of firm *i* during period *t*. Earnings performance is then separated into signal and noise components through a time-series regression of earnings performance, A_{it} on firm-specific stock-price performance, s_{it}:

$$A_{it} = \phi_{0i} + \phi_{1i} s_{it} + E_{it}. \quad (2)$$

E_{it} is the noise component of earnings. *RELNOISE* is constructed as a ratio of E_{it}/s_{it} using the coefficients of determination from the two regression equations (1) and (2).

I follow Core, Guay, and Verrecchia (2003) and Ittner, Larcker and Rajan (1997) and identify firm size, measured as the log(sales), and lagged firm performance, measured as lagged Return on Assets as control variables.[6] I also

[6] Core, Guay, and Verrecchia (2003) measure firm size as the log(market value). However, given that the compensation package is comprised of price, and log(market value) is a function of price,

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include a dummy variable that takes the value of 1 for any firms in a technology industry as defined by the firm having one of the following three-digit SIC codes: 283, 357, 360, 361, 362, 363, 364, 365, 366, 367, 368, 481, 737, or 837. My first-stage regression equation assumes a normal distribution of the error terms and is estimated by firm for each period in the sample using the following maximum-likelihood regression of the determinants of CEO compensation structure:

$$CS_{it} = \beta_{0i} + \beta_{1i}RELNOISE_{it} + \beta_2\, ln(sales)_{it} + \beta_3 TECHIND_{it} + \beta_4 ROA_{it} + \varepsilon_{it}\ , \quad (3)$$

where CS_{it} is the CEO's compensation structure in period *t*. Table 2.4 shows the maximum-likelihood parameter estimates for equation (3).

Table 2.4

Maximum-likelihood Regression of the Determinants of a CEO's Compensation Structure

$$CS_{it} = \beta_{0i} + \beta_{1i}RELNOISE_{it} + \beta_2\, ln(sales)_{it} + \beta_3 TECHIND_{it} + \beta_4 ROA_{it} + \varepsilon_{it} \qquad \textbf{(3)}$$

	Estimate	SE	t-value	One-Sided P-Value	
Intercept	0.324	0.038	8.46	<0.0001	***
RELNOISE	0.056	0.020	2.81	0.0025	***
Ln(Sales)	0.006	0.005	1.21	0.1139	
TECHIND	-0.063	0.020	-3.17	0.0010	***
ROA	-0.741	0.111	-6.68	<0.0001	***

Notes:

This table reports the results of a maximum-likelihood regression of the determinants of a CEO's compensation structure using Equation (3) for 1,230 CEO firm-year observations.

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it appeared more appropriate to use log(sales) as the measure of firm size. I thank Charles Enis for this suggestion.

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CEO's Compensation Structure (CS) - The ratio of Earnings-Based Compensation/Total Annual Compensation. **Earnings-Based Compensation** is the sum of salary, bonus, long-term incentive payouts that are indicated to be based on earnings targets (this is the default assumption when no indication of performance target is provided in the proxy statement), the present value of pension benefits, other annual compensation, and all other compensation (which excludes other annual compensation). **Total Annual Compensation** is the sum of earnings-based compensation, the value of restricted stock, the value of stock held, the value of stock option grants, the value of in the money exercisable options, and the value of in the money non-exercisable options. Additional definitions for each of the listed compensation components are provided in table 2.1.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

TECHIND - An indicator variable that is 1 when the three digit SIC code is 283, 357, 360, 361, 362, 363, 364, 365, 366, 367, 368, 481, 737, or 837 and is 0 if the three digit SIC code does not fall into one of these numbers.

ROA - Lagged return on assets.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a one-tail test, respectively.

Table 2.4 provides evidence that a CEO's compensation structure is positively associated with the relative noise ratio. This evidence is contrary to theoretical predictions and prior empirical results that find that a CEO's compensation structure is negatively associated with the relative noise ratio. In untabulated analysis, I do not find support for the notion that CEO power dictates this positive relation.[7] The positive relation is consistent with the notion that

[7] If the CEO has the power to influence his own compensation, he may seek to have more compensation associated with noisier measures so that external evaluation of the appropriateness of his pay is difficult. To examine this possibility further, I examined whether various measures of CEO power could provide a potential explanation for the positive association between the relative noise in earnings to stock price and the CEO's compensation structure. CEO power is defined in one of four ways, whether the CEO was a member of the board of directors, whether the CEO was the chairman of the board, whether the CEO was on the compensation committee, and whether the CEO was the founder of the firm. All of the CEOs in my sample were members of the board of directors, so I did not analyze this power relationship. I ran three separate maximum-likelihood regressions, one for each of the remaining measures of CEO power, with an indicator variable, which took the value of 1 when one of the power relationships was present and 0 otherwise. I also included an interaction term that interacted the power

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certain compensation components encourage a CEO to increase volatility over time.

CEOs in technology industries have less earnings-based compensation. This is consistent with the notion that growth firms try to preserve cash for future investment opportunities. Table 2.4 also provides evidence that the compensation structure is negatively and significantly associated with a firm's return on assets. This is consistent with the notion that CEOs who have better performance have longer tenures and, thus, have more opportunities to accumulated stock holdings.

Now that I have conducted an analysis of the determinants of a CEO's compensation structure, I turn my attention to understanding the determinants of changes in a CEO's compensation structure. My first-stage regression equation assumes a normal distribution of the error term. There is one change observation for each CEO, so the maximum-likelihood regression is run using 300 CEO observations using the following equation:

$$\Delta CS_i = \beta_{0i} + \beta_{1i}\Delta RELNOISE_i + \beta_2 \Delta\, ln(sales)_i + \beta_3 ROA_i + \varepsilon_i \quad , \quad (3.1)$$

where ΔCS_i is the change in a CEO's compensation structure from Period 1 to Period 2. For this regression, the TECHIND control variable is eliminated because it is unlikely that the firm's industry classification changes during the sample period. Table 2.5 shows the maximum-likelihood estimates.

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relationship variable with the RELNOISE variable. The interaction term was not significant in any of the three regressions. The lack of significance is inconsistent with the notion that CEO power affects the relation between the relative noise ratio and the CEO's compensation structure.

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Table 2.5

Maximum-likelihood Regression of the Determinants of Changes in a CEO's Compensation Structure

$$\Delta CS_i = \beta_{0i} + \beta_{1i}\Delta RELNOISE_i + \beta_2 \Delta\, ln(sales)_i + \beta_3 ROA_i + \varepsilon_i$$ **Equation (3.1)**

	Estimate	SE	t-value	Two-Sided P-Value	
Intercept	-0.026	0.014	-1.82		
Change in RELNOISE	-0.001	0.002	-0.51	0.6073	
Change Ln(Sales)	-0.055	0.031	-1.77	0.0786	*
Change ROA	-0.090	0.164	-0.55	-0.5500	

Notes:

This table reports the results of a maximum-likelihood regression of the determinants of changes in a CEO's compensation structure using Equation (3.1). Each CEO has one change in compensation structure, so the sample size for this analysis is 300 CEO observations.

CEO's Compensation Structure (CS) - The ratio of Earnings-Based Compensation/Total Annual Compensation. **Earnings-Based Compensation** is the sum of salary, bonus, long-term incentive payouts that are indicated to be based on earnings targets (this is the default assumption when no indication of performance target is provided in the proxy statement), the present value of pension benefits, other annual compensation, and all other compensation (which excludes other annual compensation). **Total Annual Compensation** is the sum of earnings-based compensation, the value of restricted stock, the value of stock held, the value of stock option grants, the value of in the money exercisable options, and the value of in the money non-exercisable options. Additional definitions for each of the listed compensation components are provided in table 2.1.

Change in CEO's Compensation Structure (CS) - The change in a CEO's compensation structure between Period 1 and Period 2.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm-specific stock returns.

Change in RELNOISE - The change in RELNOISE from Period 1 to Period 2.

LN(Sales) - Log of Sales

Change Ln(Sales) - The change in Ln(Sales) from Period 1 to Period 2.

ROA - Lagged return on assets.

Change ROA - The change in ROA from Period 1 to Period 2.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

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Since prior research of the determinants of a CEO's compensation structure does not provide guidance on the association between the relative noise of performance measures and changes in a CEO's compensation structure, the estimates of statistical significance are based on two-sided p-values. The results in Table 2.5 indicate that the change in a CEO's compensation structure is negatively and significantly associated with a change in sales. This is consistent with the notion that CEOs of performing firms have longer tenures and thus have more time to accumulate stock.

The fitted values of the likelihood function for CS_{it} and ΔCS_i from equations (3) and (3.1) are used in the second-stage competing risks regressions to examine determinants of a CEO's tenure. Please see Appendix A for a detailed discussion of the competing risks regression. For the competing risks regression, the sample is reduced to one observation per CEO, and the control variables for the levels analysis are measured in the last full year that the CEO was a CEO of that firm. As with any hazard model, the left-hand side variable is a duration variable, which I denote *TENURE*. *TENURE* is defined as the first full fiscal year in which the CEO is at least 58 years of age or older and is the CEO of the firm through the last full fiscal year preceding the CEO's departure from the firm. The following competing risks model is used:

$$TENURE(t, X)_i =$$

$$Tenure_{0g} * \exp[\beta_1 \widehat{CS}_i + \beta_2\, ln(sales)_i + \beta_3 TECHIND_i + \beta_4 ROA_i + \beta_5 Ret_i +$$

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$$D_g\{\, \delta_{g1}\widehat{CS}_i + \delta_{g2}\, ln(sales)_i + \delta_{g3}TECHIND_i + \delta_{g4}ROA_i + \delta_{g5}Ret_i\}\big] + \xi_i\,, \quad (4)$$

where *g*, denotes the reason a CEO leaves the firm, retirement, poor performance, or merger and acquisition, coded 0 through 2 respectively. All other reasons why a CEO leaves the firm are coded as 3, and are used as the comparison group. *D* is a dummy variable that equals one when the reason a CEO leaves matches the reason denoted by the *g* subscript and is zero for all other reasons the CEO leaves.[8] The results of the intercepts for each variable in the regression are not shown to highlight the three reasons why CEOs leave that are of interest in this study.

Table 2.6 provides the competing risks regression estimates of the determinants of a CEO's tenure.

[8] The research assumes that the compensation committee adjusts the CEO's compensation in anticipation of the CEO's departure reason. While ten total departure reasons could be identified, several of these departure reasons, such as death or illness, are unlikely to either be anticipated by the compensation committee or, if the departure reason was to be anticipated, the compensation committee may not adjust for this departure reason. As such, the departure reasons are lumped into four categories of interest, retirement is coded as 0, resignation due to poor performance is coded as 1, merger and acquisition is coded as 2, and the remaining departure reasons are left as the control group and coded as 3.

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Table 2.6

Competing Risks Regression of the Determinants of a CEO's Tenure

$$TENURE(t,X)_i = Tenure_{0g} * \exp\left[\beta_1 \widehat{CS}_i + \beta_2\, ln(sales)_i + \beta_3 TECHIND_i + \beta_4 ROA_i + \beta_5 Ret_i + D_g\{\, \delta_{g1}\widehat{CS}_i + \delta_{g2}\, ln(sales)_i + \delta_{g3} TECHIND_i + \delta_{g4} ROA_i + \delta_{g5} Ret_i\}\right] + \xi_i \quad (4)$$

	Estimate	Chi-Square	Two-Sided P-Value	
Compensation Structure (Pred)*Retirement	6.691	2.356	0.125	
Compensation Structure (Pred)*PoorPerf	-1.984	0.079	0.778	
Compensation Structure (Pred) * M&A	-3.497	0.371	0.543	
Ln(Sales)*Retirement	0.101	2.340	0.126	
Ln(Sales)*PoorPerf	-0.029	0.060	0.799	
Ln(Sales) * M&A	-0.005	0.003	0.953	
TECHIND*Retirement	0.368	1.091	0.296	
TECHIND*PoorPerf	-0.026	0.000	0.964	
TECHIND * M&A	-0.152	0.102	0.749	
ROA*Retirement	9.676	6.243	0.013	**
ROA*PoorPerf	-5.065	0.650	0.419	
ROA* M&A	-6.889	1.781	0.182	
Ret*Retirement	0.515	5.400	0.020	**
Ret*PoorPerf	-1.832	11.898	0.001	***
Ret* M&A	0.208	0.443	0.506	

Notes:
This table reports the result of a competing risks regression which examines the determinants of a CEO's tenure using Equation (4). The analysis is grouped by the reason a CEO left the firm. The compensation structure variable included in the model is the predicted compensation structure that was obtained from the Maximum-likelihood regression Equation (3). This competing risks analysis was conducted using one observation per CEO, so the sample size is 300.
Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether these was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

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Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

CEO's Compensation Structure (Pred) - The predicted ratio of Earnings-Based Compensation/Total Annual Compensation developed using regression equation (3).

LN(Sales) - Log of Sales

TECHIND - An indicator variable, that is 1 when the three digit SIC code is 283, 357, 360, 361, 362, 363, 364, 365, 366, 367, 368, 481, 737, or 837 and is 0 if the three digit SIC code does not fall into one of these numbers.

ROA - Lagged return on assets.

RET - Is the buy and hold return for firm i for year t.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

Two-tailed hypothesis tests are used for inferences. Table 2.6 indicates that regardless of the reason a CEO left the firm, the compensation structure is not associated with a CEO's tenure. In addition, untabulated results testing differences between the compensation structures for the retirement, poor performance, and merger and acquisition groups indicate no significant differences between the three groups. The lack of significance for a relation between compensation structure and tenure, and for differences in compensation structures, does not offer insight into whether compensation committees adjust a CEO's compensation to offset changes in the CEO's career concerns. Instead, the combination of these results suggests that if the compensation structure is adjusted, the adjustments are similar for all three groups. Table 2.6 does provide evidence that both return on assets and stock returns are positively associated with a CEO's tenure when the CEO retires from a firm. Interestingly, Table 2.6 also reports a negative relation between stock returns and tenures for CEOs who

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resigned due to poor performance. Given the earlier results regarding the lack of difference in compensation structures, the fact that firm performance is associated with how a CEO leaves, suggests that compensation committees allow firm performance to decide how a CEO leaves the firm.

Now that I have examined the determinants of a CEO's tenure based on the CEO's compensation structure, I repeat the competing risks regression to examine whether changes in a CEO's compensation structure are associated with his tenure using the following equation:

$$TENURE(t,X)_i = Tenure_{0g} * \exp\left[\beta_1 \widehat{\Delta CS}_i + \beta_2\, \Delta ln(sales)_i + \beta_3 \Delta ROA_i + \beta_4 \Delta Ret_i + D_g\{\, \delta_{g1} \widehat{\Delta CS}_i + \delta_{g2}\, \Delta ln(sales)_i + \delta_{g3} \Delta ROA_i + +\delta_{g4} \Delta Ret_i\}\right] + \xi_i \quad , \tag{4.1}$$

where *g*, denotes the reason a CEO leaves the firm, retirement, poor performance, or merger and acquisition, coded 0 through 2 respectively. All other reasons why a CEO leaves the firm coded as 3, and are used as the comparison group. *D* is a dummy variable that equals one when the reason a CEO leaves matches the reason denoted by the *g* subscript and is zero for all other reasons the CEO leaves. The results of the intercepts for each variable in the regression are not shown to highlight the three reasons why CEOs leave of interest in this study.

Table 2.7 provides the competing risks regression estimates of the determinants of a CEO's tenure using the changes in the CEO's compensation structure as a predictor variable.

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Table 2.7

Competing Risks Regression of the Determinants of a CEO's Tenure Using a Change Analysis

$$TENURE(t,X)_i = Tenure_{0g} * \exp\left[\beta_1 \widehat{\Delta CS}_i + \beta_2\, \Delta ln(sales)_i + \beta_3 \Delta ROA_i + \beta_4 \Delta Ret_i + D_g\{\, \delta_{g1} \widehat{\Delta CS}_i + \delta_{g2}\, \Delta ln(sales)_i + \delta_{g3} \Delta ROA_i + +\delta_{g4} \Delta Ret_i\}\right] + \xi_i \qquad (4.1)$$

	Estimate	Chi-Square	Two-Sided P-Value	
Chng in Comp Structure (Pred)*Retirement	-22.579	0.656	0.418	
Chng in Comp Structure (Pred)*PoorPerf	-120.231	6.745	0.009	***
Chng in Comp Structure (Pred) * M&A	25.348	48.545	<0.0001	***
Change in Ln(Sales)*Retirement	-1.794	1.332	0.249	
Change in Ln(Sales)*PoorPerf	-6.990	7.185	0.007	***
Change in Ln(Sales) * M&A	0.458	2.174	0.140	
Change in ROA*Retirement	0.977	0.139	0.709	
Change in ROA*PoorPerf	-11.764	6.150	0.013	**
Change in ROA* M&A	5.573	14.470	0.000	***
Change in Ret*Retirement	-0.205	1.812	0.178	
Change in Ret*PoorPerf	0.330	1.752	0.186	
Change in Ret* M&A	0.031	0.011	0.918	

Notes:
This table reports the result of a competing risks regression which examines the determinants of a CEO's tenure based on changes in explanatory variables as shown in Equation (4.1). The analysis is grouped by the reason a CEO left the firm. The change in compensation structure variable included in the model is the predicted change in compensation structure that was obtained from the Maximum-likelihood regression Equation (3.1). This competing risks analysis was conducted using one observation per CEO, so the sample size is 300.

Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether these was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

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Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

CEO's Compensation Structure (Pred) - The predicted ratio of Earnings-Based Compensation/Total Annual Compensation developed using regression equation (3.1).

Change in CEO's Compensation Structure (Pred) - The change in a CEO's compensation structure between Period 1 and Period 2.

LN(Sales) - Log of Sales

Change Ln(Sales) - The change in Ln(Sales) from Period 1 to Period 2.

ROA - Lagged return on assets.

Change ROA - The change in ROA from Period 1 to Period 2.

RET - Is the buy and hold return for firm i for year t.

Change in RET - The change in the RET from Period 1 to Period 2.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

While a CEO's compensation structure is not related to his tenure, changes in his compensation structure are related to his tenure for both the poor performance and the merger and acquisition groups. For the poor performance group, stock-based compensation increased with tenure. In addition, the changes in compensation structure for both the poor performance and retirement groups are similar. Finally, changes in performance are negatively associated with tenure for CEOs in the poor performance group. The combination of these results suggest that compensation committees increase stock-based compensation as CEOs approach retirement but not in a manner that appears to suggest that the compensation committee distinguishes between how a CEO will leave the firm. Instead, it appears that compensation committees allow firm performance to determine how a CEO, who is of retirement age, leaves the firm.

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For the mergers and acquisition group, increases in stock-based compensation are associated with shorter tenures. This is consistent with the notion that significant increases in stock-based compensation can motivate a CEO to find ways to unwind his equity positions as his career concerns change. Becoming a target of a merger or acquisition may afford the CEOs such an opportunity. The changes in compensation structure for the mergers and acquisition group are significantly different than the changes in compensation structure of both the retirement and poor performance groups. While the changes in compensation structure for the mergers and acquisition group are significantly different from the retirement and poor performance groups, univariate statistics indicate that the changes in compensation structure for the mergers and acquisition group result in compensation structures that are similar between the mergers and acquisition group and the retirement groups for the period immediately preceding when the CEO left the firm. Thus, the changes in compensation structure for the mergers and acquisition group also appears to support the notion that, while compensation committees appear to adjust a CEO's compensation structure as he approaches retirement, they do not do so in a manner that is indicative that they anticipate how a CEO will leave the firm.

In the final step, I return to the original analysis of the determinants of a CEO's compensation structure. Only now I include the estimates of tenure obtained from the competing risks analysis as an explanatory variable. The final

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regression equation for the examination of the determinants of a CEO's compensation structure is presented below:

$$CS_{it} = \alpha_{0i} + \alpha_{1i}RELNOISE_{it} + \alpha_{2i}Tenure(t,X)_i + \alpha_{3i}\, ln(sales)_{it} + \alpha_{4i}TECHIND_{it} + \alpha_{5i}ROA_{it} + \varepsilon_{it} \quad , \qquad (5)$$

where CS_{it} is the CEO's compensation structure in period *t*. Table 2.8 shows the maximum-likelihood parameter estimates for equation (5).

Table 2.8

Maximum-likelihood Regression of the Determinants of a CEO's Compensation Structure

$$CS_{it} = \alpha_{0i} + \alpha_{1i}RELNOISE_{it} + \alpha_{2i}Tenure(t,X)_i + \alpha_{3i}\, ln(sales)_{it} + \alpha_{4i}TECHIND_{it} + \alpha_{5i}ROA_{it} + \varepsilon_{it} \qquad \textbf{(5)}$$

	Estimate	SE	t-value	Two-Sided P-Value	
Intercept	0.300	0.041	7.36	<0.0001	***
RELNOISE	0.055	0.020	2.80	0.005	***
Tenure(t,X)	0.041	0.023	1.78	0.075	*
Ln(Sales)	0.005	0.005	1.07	0.286	
TechInd	-0.062	0.020	-3.12	0.002	***
ROA	-0.762	0.111	-6.84	<0.0001	***

Notes:

This table reports the results of a maximum-likelihood regression of the determinants of a CEO's compensation structure using Equation (5) for 1,230 CEO firm-year observations. The estimate of tenure used in the model is the estimated tenure obtained from the competing risks regression Equation (4). The estimate of tenure is obtained independently for each CEO and is grouped by the reason the CEO left the firm.

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CEO's Compensation Structure (CS) - The ratio of Earnings-Based Compensation/Total Annual Compensation. **Earnings-Based Compensation** is the sum of salary, bonus, long-term incentive payouts that are indicated to be based on earnings targets (this is the default assumption when no indication of performance target is provided in the proxy statement), the present value of pension benefits, other annual compensation, and all other compensation (which excludes other annual compensation). **Total Annual Compensation** is the sum of earnings-based compensation, the value of restricted stock, the value of stock held, the value of stock option grants, the value of in the money exercisable options, and the value of in the money non-exercisable options. Additional definitions for each of the listed compensation components are provided in table 2.1.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

Tenure(t,X) - The predicted value of Tenure based on the departure method generated by Equation (4).

LN(Sales) - Log of Sales

TECHIND - An indicator variable, that is 1 when the three digit SIC code is 283, 357, 360, 361, 362, 363, 364, 365, 366, 367, 368, 481, 737, or 837, and is 0 if the three digit SIC code does not fall into one of these numbers.

ROA - Lagged return on assets.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

Table 2.8 indicates that a CEO's compensation structure is still positively associated with the relative noise ratio. As explained earlier, this is consistent with the notion that, in a multi-period setting, compensation structure can encourage increases in volatility. Table 2.8 also provides evidence that a CEO's tenure is positively associated with his compensation structure. This is inconsistent with the notion that CEOs who have longer tenure have more of an opportunity to accumulate stock. The positive association is consistent with the notion put forth by Smith and Watts (1982) that CEOs become more risk averse as they approach retirement and unwind their equity positions.

CEOs in technology industries have less earnings-based compensation. This is consistent with the notion that growth firms try to preserve cash for future investment opportunities and, thus, would prefer to compensate the CEO using

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more stock-based compensation. Table 2.8 also provides evidence that the compensation structure is negatively and significantly associated with a firm's return on assets. This is consistent with the notion that CEOs who have better performance have longer tenures and, thus, have more opportunities to accumulate stock holdings.

Finally, the maximum-likelihood estimation is repeated to examine the determinants of changes in a CEO's compensation structure. I include the estimates of tenure obtained from the competing risks regression which examined the determinants of tenure using the changes in CEOs compensation structures. The final regression equation for the examination of changes in a CEO's compensation structure is presented below:

$$\Delta CS_i = \alpha_{0i} + \alpha_{1i}\Delta RELNOISE_i + \alpha_{2i}Tenure(t,X)_i + \alpha_{3i}\,\Delta\, ln(sales)_i + \alpha_{4i}\Delta ROA_i + \omega_i \quad , \qquad (5.1)$$

where ΔCS_{it} is the change in a CEO's compensation structure from Period 1 to Period 2. The results for regression (5.1) are presented in Table 2.9.

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Table 2.9

Maximum-likelihood Regression of the Determinants of Changes in a CEO's Compensation Structure

$$\Delta CS_i = \alpha_{0i} + \alpha_{1i}\Delta RELNOISE_i + \alpha_{2i}Tenure(t,X)_i + \alpha_{3i}\,\Delta\, ln(sales)_i + \alpha_{4i}\Delta ROA_i + \omega_i \quad \textbf{(5.1)}$$

	Estimate	SE	t-value	Two-Sided P-Value
Intercept	-0.050	0.025	-2.02	
Change in RELNOISE	-0.001	0.002	-0.63	0.527
Tenure(t,X)	0.042	0.035	1.20	0.229
Change in LN(Sales)	-0.048	0.032	-1.52	0.130
Change in ROA	-0.075	0.165	-0.45	0.650

Notes:
This table reports the results of a maximum-likelihood regression of the determinants of changes in a CEO's compensation structure using Equation (5.1). Each CEO has one change in compensation structure, so the sample size for this analysis is 300 CEO observations. The estimate of tenure used in the model is the estimated tenure obtained from the competing risks regression Equation (4.1). The estimate of tenure is obtained independently for each CEO and is grouped by the reason the CEO left the firm.

CEO's Compensation Structure (CS) - The ratio of Earnings-Based Compensation/Total Annual Compensation. **Earnings-Based Compensation** is the sum of salary, bonus, long-term incentive payouts that are indicated to be based on earnings targets (this is the default assumption when no indication of performance target is provided in the proxy statement), the present value of pension benefits, other annual compensation, and all other compensation (which excludes other annual compensation). **Total Annual Compensation** is the sum of earnings-based compensation, the value of restricted stock, the value of stock held, the value of stock option grants, the value of in the money exercisable options, and the value of in the money non-exercisable options. Additional definitions for each of the listed compensation components are provided in table 2.1.

Change in CEO's Compensation Structure (CS) - The change in a CEO's compensation structure between Period 1 and Period 2.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

Change in RELNOISE - The change in RELNOISE from Period 1 to Period 2.

Tenure(t,X) - The predicted value of Tenure based on the departure method generated by Equation (4.1).

LN(Sales) - Log of Sales

Change Ln(Sales) - The change in Ln(Sales) from Period 1 to Period 2.

ROA - Lagged return on assets.

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Change ROA - The change in ROA from Period 1 to Period 2.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

The results presented in Table 2.9 suggest that changes in a CEO's compensation structure are not associated with changes in the relative noise ratio. This provides further support that the relative noise ratio may not be a primary determinant of compensation structure in a multi-period setting. The lack of association between a CEO's tenure and his compensation structure also provides support for the notion that, while compensation committees may plan for changes in a CEO's personal characteristics as the CEO moves through his tenure with the firm, they do not appear to do so in a manner that suggests that they anticipate why a CEO will leave the firm.

Conclusion

This chapter examines the determinants of the CEO's compensation structure in the presence of the horizon problem to gain a better understanding of the dynamic relationship between the CEO's compensation structure and his incentives as he approaches retirement. I find no evidence that a CEO's tenure is associated with his compensation structure, regardless of whether the CEO retires, resigns due to poor performance, or leaves following a merger or acquisition. I also do not find evidence of significant differences between the compensation structures of CEOs who retired, resigned following poor performance, or left following a merger or acquisition. The lack of associations and differences between compensation structures suggest that if the compensation structure is

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being adjusted, it is done in a manner that assumes all CEOs will leave for the same reason. I do find evidence that a CEO's tenure is associated with firm performance for both the retirement and poor performance groups. This suggests that the board of directors actively monitors the CEO's performance.

I use the estimates of CEO tenure generated by the competing risks regression in a maximum-likelihood regression of the determinants of a CEO's compensation structure. I find that CEOs with more earnings-based compensation have longer tenures. This is consistent with the notion that CEOs who are approaching retirement are likely to become more conservative and unwind their equity positions. I also find that the relative noise ratio is positively associated with a CEO's compensation structure. This finding is contrary to prior theoretical and empirical research that examines the determinants of a CEO's compensation structure in a single-period setting. However, certain features of a CEO's compensation structure, such as stock options, have been shown to encourage CEO's to increase volatility, which would lead the relative noise ratio to have a positive relation with a CEO's compensation structure in a multi-period setting.

While a CEO's compensation structure is not related to his tenure, changes in his compensation structure are related to his tenure for both the poor performance and the merger and acquisition groups. For the poor performance group, stock-based compensation increased with tenure. In addition, the changes in compensation structure for both the poor performance and retirement groups are similar. Finally, changes in performance are negatively associated with tenure

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for CEOs in the poor performance group. The combination of these results suggests that compensation committees increase stock-based compensation as CEOs approach retirement but not in a manner that appears to suggest that the compensation committee distinguishes between how a CEO will leave the firm. Instead, it appears that compensation committees allow firm performance to determine how a CEO, who is of retirement age, leaves the firm.

For the mergers and acquisition group, increases in stock-based compensation are associated with shorter tenures. This is consistent with the notion that significant increases in stock-based compensation can motivate a CEO to find ways to unwind their equity positions as their career concerns change. Becoming a target of a merger or acquisition may afford the CEOs such an opportunity. The changes in compensation structure for the mergers and acquisition group are significantly different than the changes in compensation structure of both the retirement and poor performance groups. While the changes in compensation structure for the mergers and acquisition group are significantly different from the retirement and poor performance groups, univariate statistics indicate that the changes in compensation structure for the mergers and acquisition group result in compensation structures that are similar between the mergers and acquisition group and the retirement groups for the period immediately preceding when the CEO left the firm. Thus, the changes in compensation structure for the mergers and acquisition group also appears to support the notion that, while compensation committees appear to adjust a CEO's

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compensation structure as he approaches retirement, they do not do so in a manner that is indicative that they anticipate how a CEO will leave the firm.

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CHAPTER 3

An Empirical Analysis of the Relation Between a CEO's Incentive Ratio and His Career Concerns

3.1 Introduction

This Chapter focuses on an examination of the link between the CEO's compensation structure and his incentives as he approaches retirement. To focus on the link between the CEO's compensation structure and his incentives as he approaches retirement, I revisit the shareholder-CEO contracting problem discussed in Chapter 1, and focus on the role that the CEO's compensation package has in relation to the CEO's incentives. Agency theory assumes that the CEO's objective is to maximize his utility. The CEO's utility is a function of his compensation contract, his career concerns, and his cost of effort. Given the CEO's objective to maximize his utility, the CEO will consider how his actions affect his compensation contract payouts in both the current and future periods.

The CEO's compensation contract relies on publicly-available performance measures, earnings, and stock price to motivate the CEO's actions. Earnings and stock price are affected by the CEO's actions and by factors that are unrelated to the CEO's actions, such as liquidity, market performance, costs of materials used in the industry, and interest rates. These other factors represent noise in the performance measures ability to convey information about the CEO's actions. According to agency theory, the compensation committee considers the relative noise in each performance measure when setting the CEO's compensation structure. The noise of the performance measure, as well as the relative weight each performance measure receives in the compensation contract, affects the

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CEO's action choices. For example, a CEO has a choice between action "A" or action "B". The compensation committee only wants to motivate the CEO to select Action "A" and thus will select the compensation structure to motivate the CEO to select the appropriate action . Action "A" affects the firm's earnings by 20% and the firm's stock price by 5%; thus, the noise in the firm's earnings with respect to action "A" is 80% and the noise in the firm's stock price with respect to action "B" is 95%. Action "B" affects the firm's earnings by 5% and effects the firm's stock price by 20%. Assume all parties have perfect knowledge as to the noise of Action "A" and Action "B." For the scenario, we will consider two weights placed on earnings in the CEO's compensation contract: 30% and 70%. I assume that the CEO's payout from each choice is a percentage of the $100 change in firm value from an action choice. The CEO's payouts are shown in Table 3.1 below:

Table 3.1 Illustration of How a CEO's Compensation Structure and Noise of Performance Measure Affect the CEO's Action Choice

		CEO's Action Choice	
		A	B
CEO's Compensation Structure	30% Earnings/70% Stock	$9.50	$15.50
	70% Earnings/30% Stock	$15.50	$9.50

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As we can see from Table 3.1, the payout a CEO receives from his action choice is determined by both his compensation structure and the affect of his action on changing each performance measure. If the compensation committee wishes to motivate the CEO to take action A, they will set the compensation structure to be 70% Earnings and 30% Stock since the CEO will earn $15.50 for action A with this compensation structure.

The contracting scenario illustrated above has been studied by Core, Guay, and Verrecchia (2003) in a single-period setting. However, as discussed in Chapter 2, multi-period contracting can result in interactions between the two performance measures and impact the relative noise present in each performance measure depending on whether one performance measure provides a more consistent reflection of the CEO's actions over time.

The previous chapter focused on the determinants of the CEO's compensation structure. This chapter focuses on the determinants of the CEO's incentive ratio, the ratio of a CEO's earnings-based incentives to stock-based incentives. Core, Guay, and Verrecchia (2003) examine the CEO's incentive ratio in a single-period setting. However, as previously noted, a CEO's career concerns are likely to impact his incentive ratio over time.

The empirical research that examines a CEO's incentives in a horizon problem setting has focused on the incentives the CEO faces immediately preceding retirement. Dechow and Sloan (1991) and Cheng (2004) both provide evidence that the presence of stock incentives mitigate a CEO's myopic behavior as the CEO approaches retirement. Instead of considering how the presence of a

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compensation-based incentive mitigates a CEO's myopic behavior as the CEO approaches retirement, Kalyta (2009) focuses on how the presence of certain compensation features may encourage a CEO to behave myopically as he approaches retirement. Kalyta (2009) finds that, when a CEO's supplemental employee retirement plan is tied to salary and bonus, the CEO is more likely to engage in accrual manipulation as they approach retirement. Dechow and Sloan (1991), Cheng (2004), and Kalyta (2009) all examine the impact of isolated compensation components incentives as a proxy of CEO incentives to behave in a predicted manner. This approach treats these incentives as being independent of the incentives generated by compensation components tied to other performance measures. However, these incentives are likely to have some interaction effects which could increase or decrease a CEO's motivation to engage in myopic behavior as he approaches retirement. As such, I propose an empirical analysis of whether the CEO's incentive ratio changes as the CEO approaches retirement. This will aid our understanding of how, or even if, the incentive ratio effects previously tested in cross-sectional settings are affected by the time dimension factors that have been considered in the horizon problem research.

3.2 Variable Definition and Descriptive Statistics

The main variable of interest in this chapter is the CEO's incentive ratio (IR). The definitions of earnings-based compensation and total compensation remain the same as in Chapter 2. Please refer to table 2.1 for additional information. The definition for a CEO's stock-based incentive relies on the observation made in Yermack (1995) that the CEO's stock holdings change

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directly in proportion to changes in shareholder wealth. Thus, the stock-based incentives are measured by the delta on the CEO's portfolio using the Black-Scholes (1970) option valuation model as adjusted by Merton (1973) for dividends. This provides an annual measure of stock-based incentives for each CEO.

Prior research has examined earnings-based incentives but has assumed that the earnings-based incentives are static throughout a CEO's career. This approach is necessitated by the manner in which earnings-based incentives are calculated. Specifically, a measure of earnings-based incentives is generated by running an OLS regression which estimates the association between changes in earnings-based compensation and changes in shareholder wealth as shown below.

$$\Delta EBC_{it} = \alpha + \beta_1 \Delta SHWLTH_{it} + \varepsilon_{it} \quad , (1)$$

where ΔEBC_{it} is the change in earnings-based compensation from year *t*-1 to year *t*, and $\Delta SHWLTH_{it}$ is the change in shareholder wealth from year *t*-1 to year *t*. Earnings-based incentives are estimated using the adjusted R^2 from this regression. In order to estimate the regression equation, the sample is restricted to CEOs who have three observations in either Period 1 or Period 2. The regression is run per CEO, per period so one adjusted R^2 was obtained for each CEO for each period. Only 98 of my sample CEOs met this criteria. Core, Guay, and Verrecchia (2003) run a similar regression but include a second explanatory variable: the change in shareholder wealth from period *t*-2 to period *t*-1. In order to estimate this regression model, I would need to either have four observations in each period or only estimate one earnings-based incentive for each CEO that has

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at least four years of total data. The latter did not seem like a viable option given that I want to examine changes in CEO's incentive ratios as they approach retirement, so I eliminated the second explanatory variable from the regression equation used by Core, Guay, and Verrecchia (2003). Please see Table 3.2 for additional information.

TABLE 3.2 VARIABLE DEFINITIONS

Earnings-based Incentives	The adjusted R^2 obtained from the following regression equation. One measure of earnings-based incentive is generated for each CEO in each period. $\Delta EBC_{it} = \alpha + \beta_1 \Delta SHWLTH_{it} + \varepsilon_{it}$, (1) where: ΔEBC_{it} is the change in earnings-based compensation from period *t*-1 to *t* $\Delta SHWLTH_{it}$ is the change in shareholder wealth from year *t*-1 to *t* This regression is estimated per-CEO, per-period for each CEO that has three observations in each period.
Equity Based Incentives	The equity based incentive follows Yermack (1995) and recognizes that the stock held by a CEO changes in proportion to the change in shareholder wealth. In this case, the equity based incentive is measured as the first derivative of the Merton (1973) Adjusted Black Scholes Model.
Incentive Ratio	Earnings-based Incentives/Equity Based Incentives

Tables 3.3A and B provide the mean and median incentive ratio variables for the three main departure reasons: retirement, resigned – poor performance, and merger and acquisition.

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TABLE 3.3A

Mean Incentive Ratio Variables

Reason for Departure	Incentive Ratio	Period 1 Incentive Ratio	Period 2 Incentive Ratio	Diff Between Period 1 and Period 2 Incentive Ratio
Retirement	1.693	1.725	1.668	-0.043
Resigned - Poor Performance	1.182	1.155	1.213	0.094
Merger, Acquisition, Spinoff	2.812	2.576	2.894	-0.516
All (N = 98)	1.885	1.850	1.897	-0.091

Notes:

Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether there was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, and acquisition, or a spinoff transaction.

Incentive Ratio - The ratio of earnings-based incentives/stock-option delta.

Earnings-Based Incentives- The adjusted R2 obtained from the following regression equation. One measure of earnings-based incentive is generated for each CEO in each period.

$$\Delta EBC_{it} = \alpha + \beta_1 \Delta SHWLTH_{it} + \varepsilon_{it} \quad , (1)$$

where: ΔEBC_{it} is the change in earnings-based compensation from period t-1 to t and $\Delta SHWLTH_{it}$ is the change in shareholder wealth from year t-1 to t

This regression is estimated per-CEO, per-period for each CEO that has three observations in each period.

Stock-Option Delta - The first derivative of the Merton (1973) Adjusted Black Scholes Model.

***, **, and * indicate that the difference between the two groups are significant at the 1, 5, and 10 percent levels in a two-tail test, respectively. I use the t-test for the mean.

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TABLE 3.3B

Median Incentive Ratio Variables

Reason for Departure	Incentive Ratio	Period 1 Incentive Ratio	Period 2 Incentive Ratio	Diff Between Period 1 and Period 2 Incentive Ratio
Retirement	1.197	1.202	1.190	0.052
Resigned - Poor Performance	1.074	1.079	1.010	-0.009
Merger, Acquisition, Spinoff	1.220	1.318	1.212	0.015
All (N = 98)	1.193	1.202	1.179	0.043

Notes:

Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether there was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

Incentive Ratio - The ratio of earnings-based Incentives/Stock-option delta.

Earnings-Based Incentives - The adjusted R2 obtained from the following regression equation. One measure of earnings-based incentive is generated for each CEO in each period.

$$\Delta EBC_{it} = \alpha + \beta_1 \Delta SHWLTH_{it} + \varepsilon_{it} \quad (1)$$

where: ΔEBC_{it} is the change in earnings-based compensation from period t-1 to t and $\Delta SHWLTH_{it}$ is the change in shareholder wealth from year t-1 to t

This regression is estimated per-CEO, per-period for each CEO that has three observations in each period.

Stock-Option Delta - The first derivative of the Merton (1973) Adjusted Black Scholes Model.

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***, **, and * indicate that the difference between the two groups are significant at the 1, 5, and 10 percent levels in a two-tail test, respectively. I use the t-test for the mean.

There were no differences in any of the means or median incentive ratios between Period 1 and Period 2. This is interesting because it is consistent with the notion that compensation committees maintain consistent incentive ratios for CEOs despite changes in personal characteristics as CEOs approach retirement. Previous empirical research in the horizon problem setting would have led us to expect compensation committees to increase a CEO's stock-based incentives as a CEO approaches retirement to offset myopic behavior encouraged by the changes in a CEO's personal characteristics.

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Table 3.4 A

Pearson Correlation and Spearman Correlation For CEOs who Retired

								Spearman Correlation						
		Period 1 Incentive Ratio		Period 2 Incentive Ratio		Age		Tenure		RELNOISE	Ln(Sales)		ROA
Pearson Correlation	Period 1 Incentive Ratio			0.83067	***	-0.2034		-0.0956		0.0655	0.3844	**	0.0002
	Period 2 Incentive Ratio	0.9315	***			-0.0325		0.0875		-0.0027	0.4205	***	-0.0258
	Age	-0.0061		0.0197				0.5302	***	0.0543	-0.3059	***	-0.1036
	Tenure	0.0353		0.0604		0.7547	***			0.0455	-0.1591	*	-0.0532
	RELNOISE	-0.0601		-0.0652		0.0108		-0.0132			-0.0418		0.1072
	Ln(Sales)	0.3677	**	0.3845	***	-0.2261	***	-0.2135	**	-0.0569			0.0132
	ROA	-0.0057		-0.0106		-0.1276		-0.1180		0.1227	0.2386	***	

Notes:

Retirement - CEOs who retired from the firm. Retirement is identified by age, the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether theser was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the COE to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Period 1 Incentive Ratio - This variable is the incentive ratio for all firm year observations identified as period 1 observations. Period 1 is identified as firm years that are equal to or less than the midpoint year of a CEO's tenure.

Period 2 Incentive Ratio - This variable is the incentive ratio for all firm year observations identified as Period 2 observations. Period 2 is identified as firm years that are greater than the midpoint year of a CEO's tenure.

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Age - The age of a CEO in the year that the CEO departed the firm.

Tenure - The tenure of a CEO in years, computed as the difference between the date the CEO left his position as a CEO and the later of either the date the CEO became the CEO of the firm or the first day of the fiscal year in which the CEO was 58 years of age.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

ROA - Lagged return on assets.

***, **, and * indicate that the correlation coefficient is significantly different from zero at the 1, 5, and 10 percent levels in a two-tail test, respectively.

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Table 3.4 B

Pearson Correlation and Spearman Correlation For CEOs who Resigned - Poor Performance

						Spearman Correlation				
		Period 1 Incentive Ratio		Period 2 Incentive Ratio	Age		Tenure		RELNOISE	Ln(Sales)	ROA
Pearson Correlation	Period 1 Incentive Ratio			0.2849	-0.2884		-0.3212		-0.4667	-0.2121	-0.0667
	Period 2 Incentive Ratio	0.6103	*		-0.2115		-0.1000		-0.4000	0.5758	-0.5167
	Age	-0.3008		-0.2717			0.5894	***	-0.0307	-0.0387	-0.1149
	Tenure	-0.3089		-0.2114	0.8339	***			-0.2513	-0.1631	-0.0353
	RELNOISE	-0.7398	**	-0.2999	-0.0343		-0.0520			0.2194	-0.0651
	Ln(Sales)	0.1539		0.4469	0.1189		-0.0507		0.0445		-0.2325
	ROA	-0.3557		-0.1526	0.0116		0.0133		-0.0757	0.1104	

Notes:

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Period 1 Incentive Ratio - This variable is the incentive ratio for all firm year observations identified as period 1 observations. Period 1 is identified as firm years that are equal to or less than the midpoint year of a CEO's tenure.

Period 2 Incentive Ratio - This variable is the incentive ratio for all firm year observations identified as Period 2 observations. Period 2 is identified as firm years that are greater than the midpoint year of a CEO's tenure.

Age - The age of a CEO in the year that the CEO departed the firm.

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Tenure - The tenure of a CEO in years, computed as the difference between the date the CEO left his position as a CEO and the later of either the date the CEO became the CEO of the firm or the first day of the fiscal year in which the CEO was 58 years of age.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

ROA - Lagged return on assets.

***, **, and * indicate that the correlation coefficient is significantly different from zero at the 1, 5, and 10 percent levels in a two-tail test, respectively.

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Table 3.4 C

Pearson Correlation and Spearman Correlation For CEOs who left following a Merger, Acquisition, Spinoff

		Spearman Correlation												
		Period 1 Incentive Ratio		Period 2 Incentive Ratio		Age		Tenure		RELNOISE	Ln(Sales)		ROA
Pearson Correlation	Period 1 Incentive Ratio			0.9066	***	0.0690		0.0330		-0.1513	0.4099		-0.1018
	Period 2 Incentive Ratio	0.9689	***			0.0651		0.0728		0.1105	0.4794	**	-0.0754
	Age	0.1493		0.1434				0.6135	***	0.0641	-0.0521		-0.2113
	Tenure	0.1673		0.1742		0.8114	***			0.0120	-0.0504		-0.0398
	RELNOISE	0.0235		0.1129		-0.0507		-0.0693			-0.0344		0.1542
	Ln(Sales)	0.4243		0.4185	*	0.0260		0.0122		0.0171			-0.1833
	ROA	-0.0441		-0.0491		-0.1399		-0.0105		0.0838	-0.0578		

Notes:

Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or withing a year of the consummation of a merger, and acquistion, or a spinoff transaction.

Period 1 Incentive Ratio - This variable is the incentive ratio for all firm year observations identified as period 1 observations. Period 1 is identified as firm years that are equal to or less than the midpoint year of a CEO's tenure.

Period 2 Incentive Ratio - This variable is the incentive ratio for all firm year observations identified as Period 2 observations. Period 2 is identified as firm years that are greater than the midpoint year of a CEO's tenure.

Age - The age of a CEO in the year that the CEO departed the firm.

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Tenure - The tenure of a CEO in years, computed as the difference between the date the CEO left his position as a CEO and the later of either the date the CEO became the CEO of the firm or the first day of the fiscal year in which the CEO was 58 years of age.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

ROA - Lagged return on assets.

***, **, and * indicate that the correlation coefficient is significantly different from zero at the 1, 5, and 10 percent levels in a two-tail test, respectively.

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Tables 3.4A through 3.4C provide the correlation coefficients for the three departure methods that are of focus in this study: retirement, resignation due to poor performance, and merger and acquisition.

The correlation tables show significantly positive associations between the incentive ratios for Period 1 and Period 2 for CEOs who retired, CEOs who resigned due to poor performance, and CEOs who left following poor firm performance. This again suggests that compensation committees maintain consistent incentive ratios for CEOs despite changes in personal characteristics as CEOs approach retirement.

3.3 Research Design and Empirical Results

I follow the same procedures described in Section 2.3 for the research design though the dependent variable of all of the regression equations has been changed to reflect the fact that this chapter examines the incentive ratio instead of the CEO's compensation structure as he approaches retirement. My first-stage maximum-likelihood regression equation assumes a normal distribution of the error terms and is defined as:

$$IR_{it} = \beta_{0i} + \beta_{1i}RELNOISE_{it} + \beta_2\, ln(sales)_{it} + \beta_3 TECHIND_{it} + \beta_4 ROA_{it} + \varepsilon_{it} \quad . \quad (2)$$

Table 3.5 presents the results from the maximum-likelihood equation for regression 2.

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Table 3.5

Maximum-likelihood Regression of the Determinants of a CEO's Incentive Ratio

$$IR_{it} = \beta_{0i} + \beta_{1i}RELNOISE_{it} + \beta_2 \ln(sales)_{it} + \beta_3 TECHIND_{it} + \beta_4 ROA_{it} + \varepsilon_{it}$$

Equation (2)

	Estimate	SE	t-value	Two-Sided P-Value	
Intercept	-0.9648	0.4425	-2.18		
RELNOISE	0.0064	0.0079	0.81	0.4192	
Ln(Sales)	0.4729	0.0643	7.35	<0.0001	***
TECHIND	-0.4645	0.2424	-1.92	0.0559	*
ROA	-2.5675	0.7599	-3.38	0.0008	***

Notes:

This table reports the results of a maximum-likelihood regression of the determinants of a CEO's incentive ratio using Equation (2) for 196 CEO period observations.

Incentive Ratio - The ratio of earnings-based Incentives/stock-option delta.

Earnings-Based Incentives- The adjusted R2 obtained from the following regression equation. One measure of earnings-based incentive is generated for each CEO in each period.

$\Delta EBC_{it} = \alpha + \beta_1 \Delta SHWLTH_{it} + \varepsilon_{it}$, (1)

where: ΔEBC_{it} is the change in earnings-based compensation from period t-1 to t and $\Delta SHWLTH_{it}$ is the change in shareholder wealth from year t-1 to t

This regression is estimated per-CEO, per-period for each CEO that has three observations in each period.

Stock-Option Delta - The first derivative of the Merton (1973) Adjusted Black Scholes Model.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

LN(Sales) - Log of Sales

TECHIND - An indicator variable, that is 1 when the three digit SIC code is 283, 357, 360, 361, 362, 363, 364, 365, 366, 367, 368, 481, 737, or 837 and is 0 if the three digit SIC code does not fall into one of these numbers.

ROA - Lagged return on assets.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a one-tail test, respectively.

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As shown in Table 3.5, a CEO's incentive ratio is positively associated with the relative noise of the firm's earnings to stock price. This is consistent with results obtained in Core, Guay, and Verrecchia (2003) and is consistent with the notion that, in a multi-period setting, a CEO's incentive structure can encourage a CEO to increase volatility.

While the CEO's incentive ratio is important, it is also important to examine the determinants of changes in a CEO's incentive ratio. I use the following maximum-likelihood regression equation to examine the determinants of changes in a CEO's incentive ratio:

$$\Delta IR_i = \beta_{0i} + \beta_{1i}\Delta RELNOISE_i + \beta_2 \Delta\, ln(sales)_i + \beta_3 \Delta ROA_i + \varepsilon_i \quad . \ (2.1)$$

The technology industry control variable is dropped in this regression analysis because it is unlikely that the industry changes as the CEO moves through his tenure with the firm. Table 3.6 presents the results from the maximum-likelihood equation for regression equation (2.1).

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Table 3.6

Maximum-likelihood Regression of the Determinants of Changes in a CEO's Incentive Ratio

$$\Delta IR_i = \beta_{0i} + \beta_{1i}\Delta RELNOISE_i + \beta_2 \Delta\, ln(sales)_i + \beta_3 \Delta ROA_i + \varepsilon_i$$ **Equation (2.1)**

	Estimate	SE	t-value	Two-Sided P-Value
Intercept	-0.3944	0.267	-1.48	
Change in RELNOISE	-0.0036	0.140	-0.03	0.9796
Change Ln(Sales)	0.9602	0.641	1.50	0.1385
Change ROA	-4.6074	4.221	-1.09	0.279

Notes:

This table reports the results of a maximum-likelihood regression of the determinants of changes in a CEO's incentive ratio using Equation (2.1). Each CEO has one change in incentive ratio, so the sample size for this analysis is 98 CEO observations.

Incentive Ratio - The ratio of earnings-based Incentives/Stock-option delta.

Earnings-Based Incentives- The adjusted R2 obtained from the following regression equation. One measure of earnings-based incentive is generated for each CEO in each period.

$$\Delta EBC_{it} = \alpha + \beta_1 \Delta SHWLTH_{it} + \varepsilon_{it} \text{ , (1)}$$

where: ΔEBC_{it} is the change in earnings-based compensation from period t-1 to t and $\Delta SHWLTH_{it}$ is the change in shareholder wealth from year t-1 to t

This regression is estimated per-CEO, per-period for each CEO that has 3 observations in each period.

Stock-Option Delta - The first derivative of the Merton (1973) Adjusted Black Scholes Model.

Change in CEO's Incentive Ratio (IR) - The change in a CEO's incentive ratio between Period 1 and Period 2.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

Change in RELNOISE - The change in RELNOISE from Period 1 to Period 2.

LN(Sales) - Log of Sales

Change Ln(Sales) - The change in Ln(Sales) from Period 1 to Period 2.

ROA - Lagged return on assets.

Change ROA - The change in ROA from Period 1 to Period 2.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

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Table 3.6 provides no evidence that there is any statistically significant relation between a change in a CEO's incentive ratio as he approaches retirement and a change in the relative noise. In fact, Table 3.6 does not provide evidence of any statistically significant associations between any of the control variables and changes in a CEO's incentive ratio. This is consistent with the univariate results, which suggest that compensation committees do not adjust a CEO's incentive ratios as the CEO moves through his tenure with a firm. This could be because the compensation committees determine an appropriate incentive ratio based on CEO or firm characteristics that are stable over time.

I now turn my attention to examining the association between a CEO's tenure and his incentive ratio using the following competing risks regression:

$$TENURE(t,X)_i = Tenure_{0g} * \exp\left[\beta_1 \widehat{IR}_i + \beta_2\, ln(sales)_i + \beta_3 TECHIND_i + \beta_4 ROA_i + \beta_5 Ret_i + D_g\{\, \delta_{g1}\widehat{IR}_i + \delta_{g2}\, ln(sales)_i + \delta_{g3} TECHIND_i + \delta_{g4} ROA_i + +\delta_{g5} Ret_i\}\right] + \xi_i \quad , \quad (3)$$

where *g*, denotes the reason a CEO leaves the firm. Each of the reasons a CEO leaves--retirement, resignation due to poor performance, or following a merger or acquisition--are coded 0 through 2 respectively. All other reasons why a CEO leaves the firm are grouped into a comparison group coded 3. *D* is a dummy variable that equals one when the reason a CEO leaves the firm is the same as the reason designated by *g*. The predicted values for the incentive ratio are the values

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obtained from regression equation (2). Table 3.7 provides the competing risk regression results for equation (3).

Table 3.7

Competing Risks Regression of the Determinants of a CEO's Tenure

$$TENURE(t,X)_i = Tenure_{0g} * \exp\left[\beta_1 \widehat{IR}_i + \beta_2\, ln(sales)_i + \beta_3 TECHIND_i + \beta_4 ROA_i + \beta_5 Ret_i + D_g\{\, \delta_{g1}\widehat{IR}_i + \delta_{g2}\, ln(sales)_i + \delta_{g3} TECHIND_i + \delta_{g4} ROA_i + +\delta_{g5} Ret_i\}\right] + \xi_i \quad (3)$$

	Estimate	Chi-Square	Two-sided P-Value	
Incentive Ratio (Pred)* Retirement	9.133	2.91	0.088	*
Incentive Ratio (Pred)*PoorPerf	-7.253	3.14	0.076	*
Incentive Ratio (Pred) * M&A	10.146	3.20	0.074	*
Ln(Sales)*Retirement	-4.169	2.77	0.096	*
Ln(Sales)*PoorPerf	3.039	2.84	0.092	*
Ln(Sales) * M&A	-4.513	2.92	0.088	*
TECHIND* Retirement	4.176	2.79	0.095	*
TECHIND*PoorPerf	-3.702	4.43	0.035	**
TECHIND * M&A	4.472	2.81	0.094	*
ROA* Retirement	26.478	3.65	0.056	**
ROA*PoorPerf	-17.207	2.91	0.088	*
ROA* M&A	28.743	3.88	0.049	**
Ret*Retirement	0.120	0.26	0.610	
Ret*PoorPerf	-3.270	9.56	0.002	***
Ret* M&A	-0.579	1.38	0.239	

Notes:

This table reports the result of a competing risk regression which examines the determinants of a CEO's tenure using Equation (3). The analysis is grouped by the reason a CEO left the firm. The incentive ratio variable included in the model is the predicted incentive ratio that was obtained from the Maximum-likelihood regression Equation (2). This competing risks analysis was conducted using one observation per CEO, so the sample size is 98.

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Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether there was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

CEO's Incentive Ratio (Pred) - The predicted ratio of Earnings-Based Incentives/Stock-Based Incentives developed using regression equation (3).

LN(Sales) - Log of Sales

TECHIND - An indicator variable, that is 1 when the three digit SIC code is 283, 357, 360, 361, 362, 363, 364, 365, 366, 367, 368, 481, 737, or 837 and is 0 if the three digit SIC code does not fall into one of these numbers.

ROA - Lagged return on assets.

RET - Is the buy and hold return for firm i for year t.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

While the empirical evidence in Chapter 2 did not indicate any association between a CEO's compensation structure and his tenure, the empirical evidence in Table 3.7 indicates a significant association between the CEO's incentive ratio and his compensation structure. For both the retirement and merger and acquisition groups, larger stock-based incentives are associated with shorter tenures. This is consistent with the notion that, as a CEO approaches retirement, he may become more conservative and wish to unwind his equity positions by leaving the firm. Interestingly, larger earnings-based incentives are associated with shorter tenures for the poor-performance group. This is consistent with the notion that a compensation committee will force a resignation sooner for CEOs who have significant earnings-based incentives but are not realizing the expected

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performance targets. Untabulated analysis indicates that CEOs who resign due to poor performance have significantly more stock-based incentives than either CEOs who retire or CEOs who leave following a merger or acquisition.

A number of the control variables shown in Table 3.7 are associated with tenure in the expected direction for both the retirement and merger and acquisition groups. Specifically, we see that CEOs at larger firms have shorter tenures, CEOs of technology firms have longer tenures, and CEOs who have higher returns on assets have longer tenures. The control variables for CEOs who resigned following poor performance are also associated with tenure in expected directions. Specifically, smaller firms and firms in technology industries appear to be less tolerant of poor performance since the CEOs who resign due to poor performance have shorter tenures at these firms. However, the association between returns on assets and a CEO's tenure and stock returns and a CEO's tenure do not conform with expectations for CEOs who resign due to poor performance. Specifically, each of these associations indicates that poor performance is associated with longer tenures. A potential explanation for this result is that firms with sufficiently poor performance may have difficulty attracting replacement CEOs.

The competing risks regression is repeated to examine the association between a CEO's tenure and changes in his incentive ratio. The predicted values for the change in a CEO's incentive ratio from regression equation (2.1) are used in the competing risks regression. Given the fact that it is unlikely that the firm's industry classification changed during the CEO's tenure, the industry control variable was removed, creating equation (3.1):

$$TENURE(t,X)_i = Tenure_{0g} * \exp\left[\beta_1 \widehat{\Delta IR}_i + \beta_2\, \Delta ln(sales)_i + \beta_3 \Delta ROA_i + \beta_4 \Delta Ret_i + D_g\{\, \delta_{g1} \widehat{\Delta IR}_i + \delta_{g2}\, \Delta ln(sales)_i + \delta_{g3} \Delta ROA_i + +\delta_{g4} \Delta Ret_i\}\right] + \xi_i \quad . \quad (3.1)$$

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Table 3.8 repeats the competing risks estimation of equation (3.1).

Table 3.8

Competing Risks Regression of the Determinants of a CEO's Tenure Using a Change Analysis

$$TENURE(t,X)_i = Tenure_{0g} * \exp\left[\beta_1 \widehat{\Delta IR}_i + \beta_2\, \Delta ln(sales)_i + \beta_3 \Delta ROA_i + \beta_4 \Delta Ret_i + D_g\{\, \delta_{g1} \widehat{\Delta IR}_i + \delta_{g2}\, \Delta ln(sales)_i + \delta_{g3} \Delta ROA_i + +\delta_{g4} \Delta Ret_i\}\right] + \xi_i \quad (3.1)$$

	Estimate	Chi-Square	Two-sided P-Value	
Chng in Incentive Ratio (Pred)* Retirement	25.750	0.99	0.319	
Chng in Incentive Ratio (Pred)*PoorPerf	-38.421	0.59	0.442	
Chng in Incentive Ratio (Pred) * M&A	-117.010	6.45	0.011	**
Change in Ln(Sales)* Retirement	-23.821	0.92	0.338	
Change in Ln(Sales)*PoorPerf	39.301	0.68	0.411	
Change in Ln(Sales) * M&A	109.098	6.26	0.012	**
Change in ROA* Retirement	115.674	0.95	0.330	
Change in ROA*PoorPerf	-182.958	0.62	0.429	
Change in ROA* M&A	-512.495	5.91	0.015	**
Change in Ret*Retirement	0.074	0.04	0.850	
Change in Ret*PoorPerf	1.490	8.69	0.003	***
Change in Ret* M&A	-1.269	1.48	0.225	

Notes:

This table reports the result of a competing risk regression which examines the determinants of a CEO's tenure using Equation (3.1). The analysis is grouped by the reason a CEO left the firm. The changes in incentive ratio variable included in the model is the predicted change in incentive ratio that was obtained from the Maximum-likelihood regression Equation (2.1). This competing risks analysis was conducted using one observation per CEO, so the sample size is 98.

Retirement - CEOs who retired from the firm. Retirement is identified by age; the CEO left when he was at least 59 years of age, the retirement was pre-announced at least six months prior to the actual retirement date, and/or media reports surrounding the retirement date suggest that the retirement was expected regardless of whether there was a pre-announcement of the CEO's retirement, there are no obvious indications that the retirement was forced, no mention in media reports that poor performance motivated the CEO to leave, no merger or acquisition activity, no mention that the company filed for bankruptcy, and no mention that the company had to liquidate surrounding the CEO's retirement date.

Resigned - Poor Performance - CEOs who departed the firm and the announcement indicated the departure was due to poor performance or the news reports surrounding the event indicated poor firm performance.

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Merger, Acquisition, Spinoff - CEOs who departed the firm upon the consummation of, or within a year of the consummation of, a merger, acquisition, or a spinoff transaction.

CEO's Incentive Ratio (Pred) - The predicted ratio of Earnings-Based Incentives/Stock-Based Incentives developed using regression equation (3).

Change in CEO's Incentive Ratio (Pred) - The change in a CEO's incentive ratio between Period 1 and Period 2.

LN(Sales) - Log of Sales

Change Ln(Sales) - The change in Ln(Sales) from Period 1 to Period 2.

ROA - Lagged return on assets.

Change ROA - The change in ROA from Period 1 to Period 2.

RET - Is the buy and hold return for firm i for year t.

Change in RET - The change in the RET from Period 1 to Period 2.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

Table 3.8 provides no evidence of any significant relations between a change in a CEO's incentive ratio and his tenure for either the retirement or the resignation due to poor performance groups. There is a negative association between the change in a CEO's incentive ratio and his tenure for the mergers and acquisition group. This association is inconsistent with the notion that increases in a CEO's stock-based incentives will motivate the CEO to shorten his tenure by engaging in a merger or acquisition. However, these results are consistent with the notion that increases in a CEO's stock-based incentives will motivate the CEO to engage in a merger or acquisition when it is favorable for the CEO to do so.

In the final step, I use the tenure estimates obtained from the competing risk regression equations (3) and (3.1) as an explanatory variable for determining incentive ratio and incentive ratio changes, respectively. The final maximum-likelihood regression equation for the determinants of a CEO's incentive ratio is:

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$$IR_{it} = \alpha_{0i} + \alpha_{1i}RELNOISE_{it} + \alpha_{2i}Tenure(t,X)_i + \alpha_{3i}\,ln(sales)_{it} + \alpha_{4i}TECHIND_{it} + \alpha_{5i}ROA_{it} + \varepsilon_{it} \quad , \quad (4)$$

where IR_{it} is the incentive ratio for a CEO in period t, and $Tenure(t,X)_i$ is the tenure estimate obtained from competing risk regression equation (3). Table 3.9 presents the results for the maximum-likelihood regression of the determinants of a CEO's incentive ratio.

Table 3.9

Maximum-likelihood Regression of the Determinants of a CEO's Incentive Ratio

$$IR_{it} = \alpha_{0i} + \alpha_{1i}RELNOISE_{it} + \alpha_{2i}Tenure(t,X)_i + \alpha_{3i}\,ln(sales)_{it} + \alpha_{4i}TECHIND_{it} + \alpha_{5i}ROA_{it} + \varepsilon_{it} \quad \textbf{(4)}$$

	Estimate	SE	t-value	Two-sided P-value	
Intercept	-0.3034	0.4940	-0.61		
RELNOISE	0.0062	0.0078	0.79	0.428	
Tenure(t,X)	-0.9735	0.3334	-2.92	0.004	***
Ln(Sales)	0.5113	0.0652	7.85	<0.0001	***
Techind	-0.4826	0.2406	-2.01	0.045	**
ROA	-2.8500	0.7599	-3.75	0.000	***

Notes:

This table reports the results of a maximum-likelihood regression of the determinants of a CEO's incentive ratio using Equation (4) for 196 CEO period observations. The estimate of tenure used in this model is the estimated tenure obtained from the competing risk regression Equation (3). The estimate of tenure is obtained independently for each CEO and is grouped by the reason the CEO left the firm.

Incentive Ratio - The ratio of earnings-based Incentives/Stock-option delta.

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Earnings-Based Incentives- The adjusted R2 obtained from the following regression equation. One measure of earnings-based incentive is generated for each CEO in each period.

$\Delta EBC_{it} = \alpha + \beta_1 \Delta SHWLTH_{it} + \varepsilon_{it}$, (1)

where: ΔEBC_{it} is the change in earnings-based compensation from period t-1 to t and $\Delta SHWLTH_{it}$ is the change in shareholder wealth from year t-1 to t

This regression is estimated per-CEO, per-period for each CEO that has 3 observations in each period.

Stock-Option Delta - The first derivative of the Merton (1973) Adjusted Black Scholes Model.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

Tenure(t,X) - The predicted value of Tenure based on the departure method generated by Equation (4).

LN(Sales) - Log of Sales

TECHIND - An indicator variable, that is 1 when the three digit SIC code is 283, 357, 360, 361, 362, 363, 364, 365, 366, 367, 368, 481, 737, or 837 and is 0 if the three digit SIC code does not fall into one of these numbers.

ROA - Lagged return on assets.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

Table 3.9 indicates a negative association between the CEO's tenure and his incentive ratio. This is consistent with the notion that as a CEO approaches retirement, and becomes more risk averse, higher levels of stock-based incentives encourage the CEO to leave so that he can unwind his risky equity positions. The remaining results presented in Table 3.9 are consistent with the results obtained in Table 3.5 which also examined the determinants of a CEO's incentive ratio but did not contain a measure of CEO tenure in the regression estimates. Specifically, CEOs in larger firms have more earnings-based incentives, CEOs of technology firms have more stock-based incentives, and CEOs with better performance have more stock-based incentives.

In order to conduct an analysis of whether there is an association between a change in the CEO's incentive ratio and his tenure, we repeat the above analysis

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but use the tenure predictions generated by the competing risk regression for equation (3.1).

$$\Delta IR_i = \alpha_{0i} + \alpha_{1i}\Delta RELNOISE_i + \alpha_{2i}Tenure(t,X)_i + \alpha_{3i}\,\Delta ln(sales)_i + \alpha_{4i}\Delta ROA_i + \omega_i \quad . \qquad (4.1)$$

A firm's industry is not expected to change during the CEO's tenure. As such, it is removed from the control variables. The estimates obtained from the maximum-likelihood regression equation (4.1) are presented in table 3.10.

Table 3.10

Maximum-likelihood Regression of the Determinants of Changes in a CEO's Incentive Ratio

$$\Delta IR_i = \alpha_{0i} + \alpha_{1i}\Delta RELNOISE_i + \alpha_{2i}Tenure(t,X)_i + \alpha_{3i}\,\Delta ln(sales)_i + \alpha_{4i}\Delta ROA_i + \omega_i \qquad (4.1)$$

	Estimate	SE	t-value	Two-sided P-value
Intercept	-0.3745	0.3318	-1.13	
Change in RELNOISE	-0.0014	0.1415	-0.01	0.9924
Tenure(t,X)	-0.0441	0.4347	-0.1	0.9195
Change in LN(Sales)	0.9386	0.6752	1.39	0.1691
Change in ROA	-4.4946	4.3644	-1.03	0.3068

The Predicted Value of the Tenure for each firm was generated from Equation (4.1).
The dependent variable is the change in the CEO's compensation structure from Period 1 to Period 2.
N = 98 CEO observations

Notes:

This table reports the results of a maximum-likelihood regression of the determinants of a CEO's incentive ratio using Equation (4) for 196 CEO Period observations. The estimate of tenure used in this model is the estimated tenure obtained from the competing risk regression Equation (3). The estimate of tenure is obtained independently for each CEO and is grouped by the reason the CEO left the firm.

Incentive Ratio - The ratio of earnings-based Incentives/Stock-option delta.

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Earnings-Based Incentives- The adjusted R2 obtained from the following regression equation. One measure of earnings-based incentive is generated for each CEO in each period.

$\Delta EBC_{it} = \alpha + \beta_1 \Delta SHWLTH_{it} + \varepsilon_{it}$, (1)

where: ΔEBC_{it} is the change in earnings-based compensation from period t-1 to t and $\Delta SHWLTH_{it}$ is the change in shareholder wealth from year t-1 to t

This regression is estimated per-CEO, per-period for each CEO that has three observations in each period.

Stock-Option Delta - The first derivative of the Merton (1973) Adjusted Black Scholes Model.

RELNOISE - is constructed as a ratio of the residual from a regression of earnings performance on firm-specific stock performance to the residual from a regression of market returns on firm specific stock returns.

Change in RELNOISE - The change in RELNOISE from Period 1 to Period 2.

Tenure(t,X) - The predicted value of Tenure based on the departure method generated by Equation (4.1).

LN(Sales) - Log of Sales

Change Ln(Sales) - The change in Ln(Sales) from Period 1 to Period 2.

ROA - Lagged return on assets.

Change ROA - The change in ROA from Period 1 to Period 2.

***, **, and * indicate that the difference between the coefficient estimate is significantly different from 0 at the 1, 5, and 10 percent levels in a two-tail test, respectively.

Similar to the results presented in Table 3.6, Table 3.10 provides no evidence of statistically significant associations between any of the proposed determinants of changes in a CEO's incentive ratio. This is consistent with the univariate results, which suggest that compensation committees do not adjust a CEO's incentive ratios as the CEO moves through his tenure with a firm. This could be because the compensation committees determine an appropriate incentive ratio based on CEO or firm characteristics that are stable over time.

3.4 Conclusions

This chapter focused on the examination of the shareholder-CEO contracting relationship in regard to the incentive ratio. The evidence suggests a significant association between the CEO's incentive ratio and his tenure. For both

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the retirement and merger and acquisition groups, larger, stock-based incentives are associated with shorter tenures. This is consistent with the notion that, as a CEO approaches retirement, he may become more conservative and wish to unwind his risky equity positions by leaving the firm. Interestingly, larger earnings-based incentives are associated with shorter tenures for the poor performance group. This is consistent with the notion that a compensation committee will force a resignation sooner for CEOs who have significant earnings-based incentives but are not realizing the expected performance targets. When the estimates of tenure from the competing risk regression are included in a maximum-likelihood regression that examines the determinants of the CEO's incentive ratio, I find a negative association between the CEO's tenure and his incentive ratio. This is consistent with the notion that stock-based incentives encourage the CEO to leave so that he can unwind his risky equity positions.

For the analysis of whether there is an association between changes in a CEO's incentive ratio and his tenure, I find that increases in stock-based incentives are associated with longer tenures for CEOs who leave following a merger or acquisition. This is inconsistent with the notion that increases in a CEO's stock-based incentives will motivate the CEO to shorten his tenure by engaging in a merger or acquisition. However, these results consistent with the notion that increases in a CEO's stock-based incentives will motivate the CEO to engage in a merger or acquisition when it is favorable for the CEO to do so.

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CHAPTER 4

Contribution and Future Research

This dissertation examines the determinants of the CEO's compensation structure and his incentive ratio in the presence of the horizon problem to gain a better understanding of the dynamic relationship between the CEO's compensation structure and his incentives as he approaches retirement. Overall, the results from both Chapter 2 and Chapter 3 suggest that compensation committees adjust compensation as a CEO moves through his tenure with a firm but not in a manner that suggests that the compensation committee anticipates how a CEO will leave the firm. However, the evidence also suggests that these adjustments, when coupled with firm performance, do affect how a CEO leaves the firm.

These results can help future researchers seeking to understand how the CEO's compensation structure changes as the CEO approaches retirement age and whether these changes affect his behavior as he approaches retirement. In addition, this information could be of interest to regulators and shareholders who seek to understand the link between a CEO's compensation and the actions he takes.

There are a number of important caveats that should be noted about this study. The first is that the sample size of 300 observations, particularly for the change analysis, may not provide enough power for statistical testing. This small sample size is decreased even further for the incentive ratio analysis, which is

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conducted on 98 CEO observations. Future research could focus on expanding the sample size. In addition, the analysis is limited to CEOs who are of retirement age. While this is the focus of this study, future research could develop control samples for the poor performance and merger and acquisition samples from the CEOs who departed due to poor performance or merger and acquisition activity but were not of retirement age. This could provide some interesting insights into whether there appear to be differences in the contracting approaches used for these two different groups and would shed further light on the role of compensation contracting in the presence of career concerns.

Another limitation of this study is that it only examines quantitative performance measures. CEO compensation contracts often contain a qualitative performance measure, such as a balanced score card or customer satisfaction measures. This study implicitly assumes that the weight assigned to qualitative performance measures is independent of the CEO's multi-period compensation contracts. Future research could analyze the impact of this assumption. Finally, the sample period of this study is limited to years that precede the compensation disclosure rule change. While I do not expect the inferences to be different if this analysis were to be run on a more recent sample, future research may wish to replicate this analysis to determine if there were any significant changes that result from the increased compensation disclosure requirements.

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Another important caveat needs to be made in respect to these results. The sample selection procedure may have biased the results by focusing on CEOs who were of retirement age when they left the firm. The data shown in this study can only generalize a sample of CEOs who are of retirement age. Future research may be able to determine whether these results apply to CEOs who are not of retirement age when they leave the firm. Future research could focus on further examining the relation between a CEO's compensation structure and his actions.

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Appendix: Competing Risks Model

As discussed earlier, CEOs leave for a variety of reasons. The method by which a CEO eventually leaves a firm is similar to reasons that firms may exit a market. Research that is interested in predicting a firm's departure from a sample, such as research interested in predicting whether a firm will go bankrupt, uses a hazard model to conduct their analysis of factors that affect the firm's eventual departure.[9] A hazard model is well-suited to this type of analysis but only permits one departure reason to be considered in a regression equation. Competing risks models are hazard models that allow researchers the ability to account for multiple departure reasons. I propose to use the Lunn-McNeil approach, a competing risks model that allows the multiple departure reasons to be accounted for in a single equation so that I may compare coefficients across the retirement, poor performance, and merger and acquisition groups.

The Lunn-McNeil approach, and competing risks models in general, have been used in a variety of settings. Kleinbaum and Klein (2005) point out a number of uses in bioinformatics studies. Deng, Quigley, and van Order (2000) use a competing risks model to examine the characteristics that determine whether homeowners terminate mortgages through default or prepayment. Dolton and van der Klaauw (1999) use a competing risks model to analyze the relation between wages and whether a teacher exits the profession or exits the workforce. Harrison (2007) uses the competing risks model to analyze the relation between hospitals productivity, cost factors, and a hospital's exit method: merger, acquisition, or

[9] The use of "departure" is a carryover term from bioinformatics studies which were the first studies that developed and used competing risks models.

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closure. While Harrison's (2007) study focuses on firm level exits, the regression can also be applied to the individual firm, which is what I am doing in this study.

While the Lunn-McNeil approach has a number of desirable characteristics, it requires certain assumptions to be made about the characteristics of the data. The major assumption is that the model does not suffer from a correlated omitted variable problem which causes predictions of how a CEO leaves the firm based on the independent variables included in the model to consistently differ from the way a CEO actually leaves the firm. For example, the Lunn-McNeil approach assumes that the independent variables, such as compensation structure and firm performance, accurately predict that a CEO retires when he is most likely going to retire. There is one type of competing risk model that allows for interdependence of departure reasons, but it does not allow for the reasons a CEO leaves to be run in a single model. This forces me to make a choice between the potential bias induced by a correlated omitted variable and the ability to compare coefficients across various departure reasons. I have elected to use the Lunn-McNeill approach assuming that my model does not suffer from a correlated omitted variable problem.

For my study, the Lunn-McNeil (1995) approach is adapted to include four ways a CEO leaves a firm: retirement, poor performance, merger and acquisition, and all other reasons, which I will label as $\delta = 0, 1, 2,$ and 3 respectively. The 300 CEO observations are replicated four times, giving a total data set of 1,200 observations. These 1,200 observations are broken down into four 300 observation groups with an identifier for each group that marks it as one of the

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reasons a CEO leaves the firm. For example, the first 300 observations have identifiers for retirement. The next 300 observations have an identifier for poor performance, and so on. A second identifier is added to each of the groups of 300 observations. This identifier denotes the actual reason a CEO left the firm. For example, assume a CEO, *i*, leaves the firm via retirement at time *t*. We would make the following four entries in the data for that CEO.

CEO	Tenure	Status	Reason the CEO left the firm	Covariates
I	*t*	1	0	$x_i, \delta_i x_i$
I	*t*	0	1	$x_i, \theta_i x_i$
I	*t*	0	2	$x_i, \nu_i x_i$
I	*t*	0	3	$x_i, \xi_i x_i$

I then run a COX regression on the covariates $x_i, \delta_i x_i$, stratifying by the way the CEO left the firm, $\delta = 0, 1, 2,$ and 3. Four vectors of regression coefficients b_0 , b_1 , b_2 , and b_3 can be defined depending on the way a CEO leaves the firm. In this case, the partial likelihood is:

$$\prod_{t_i,\delta_i=0}\left(\frac{e^{\acute{b}_0 x_i}}{\sum_{R_i} e^{\acute{b}x}}\right)\prod_{t_i,\delta_i=1}\left(\frac{e^{\acute{b}_0 x_i + \acute{\theta} x_i}}{\sum_{R_i} e^{\acute{b}x+\acute{\theta}x_i}}\right)\prod_{t_i,\delta_i=2}\left(\frac{e^{\acute{b}_0 x_i + \acute{\upsilon} x_i}}{\sum_{R_i} e^{\acute{b}x+\acute{\upsilon}x_i}}\right)\prod_{t_i,\delta_i=3}\left(\frac{e^{\acute{b}_0 x_i + \acute{\xi} x_i}}{\sum_{R_i} e^{\acute{b}x+\acute{\xi}x_i}}\right), \quad (1)$$

treating the tenure time of each exit type separately. In each case, the risk set R_i consists of those CEOs with appropriate stratum identifier $\delta = 0, 1, 2,$ and 3 for the first, second, third, and fourth product respectively.

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The estimates of $\acute{b}_0 x_i$, $\acute{b}_0 x_i + \theta x_i$, $\acute{b}_0 x_i + \upsilon x_i$, and $\acute{b}_0 x_i + \xi x_i$ were obtained using the following hazard model:

$$TENURE(t,X)_i = Tenure_{0g} * \exp\big[\beta_1 \widehat{CS}_i + \beta_2\, ln(sales)_i + \beta_3 TECHIND_i + \beta_4 ROA_i + \beta_5 Ret_i + D_g\{\, \delta_{g1}\widehat{CS} + \delta_{g2}\, ln(sales) + \delta_{g3} TECHIND + \delta_{g4} ROA + + \delta_{g5} Ret_{g5}\}\big] + \xi_i \quad , \qquad (2)$$

where *g*, denotes the departure reason, coded 0 through 2, for each of the following departure methods, retirement, poor performance, and merger and acquisition. All other departures, coded as a 3, were used as the comparison group. *D* is a dummy variable that equals one for a particular departure reason, excluding the benchmark case.[10]

[10] The research assumes that the compensation committee adjusts the CEO's compensation in anticipation of the CEO's departure reason. While ten total departure reasons could be identified, several of these departure reasons, such as death or illness, are unlikely to either be anticipated by the compensation committee, or, if the departure reason was to be anticipated, the compensation committee may not adjust for this departure reason. As such, the departure reasons are lumped into four categories of interest, retirement is coded as 1, resignation due to poor performance is coded as 2, merger and acquisition is coded as 3, and the remaining departure reasons are left as the control group and coded as 4.

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