BOARD COMPOSITION AND THE USE OF ACCOUNTING MEASURES: THE EFFECT ON THE RELATION BETWEEN CEO COMPENSATION AND FIRM PERFORMANCE

by

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(ABSTRACT)

Boards of directors of corporations have been criticized for failing to effectively perform their roles of ratifying and monitoring managerial decisions, retaining and terminating top management, and evaluating and rewarding executive performance. Critics have suggested that increasing the proportion of outside directors on the board increases independence and improves board effectiveness. Research has provided evidence that the composition of the board affects firm performance, the likelihood of chief executive turnover, and the monitoring of important decisions such as the adoption of poison pills and acquisitions. In this study, the effect of the composition of the board on the relationship between executive compensation and firm performance is investigated. The effect of board composition on the types of performance measures, accounting and stock return, used in the pay-performance relationship is also examined.

Data were gathered from publicly available sources, including Forbes compensation surveys, firms' proxy statements, and COMPUSTAT and CRSP tapes. These data were then statistically analyzed using a regression model with indicator variables for outsider-dominated boards. The types of performance measures, accounting and stock return, were then compared to test whether their usage in the pay-performance relationship differs between outsider-dominated and insider-dominated boards.

The results of this study indicate that the association between compensation and stock return measures of performance is stronger when the board is composed of a majority of outside directors. There is no evidence, however, of a stronger association between compensation and accounting measures of performance for outsider-dominated boards. The results also reveal that outsider-dominated boards use both accounting and stock return measures of performance in the pay-performance relationship whereas insiders focus on accounting measures.

These results imply that outside directors act in the interests of shareholders by linking compensation to stock return measures as well as accounting measures of performance. These findings are consistent with the conclusions of other board composition studies that outside directors play an important role in the corporate governance process.

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CHAPTER 1

INTRODUCTION

The separation of ownership and control that characterizes most corporations creates agency problems between managers and shareholders [Jensen and Meckling (1976), Fama (1980)]. Because managers do not bear the full cost of their actions, monitoring and incentives are needed to align managers' interests with those of shareholders [Jensen and Meckling (1976)]. The board of directors of the corporation is primarily responsible for this monitoring function, and has the power to ratify and monitor important decisions, hire and fire top management, and evaluate and reward management performance [Fama and Jensen (1983)].

Boards have been criticized for failing to effectively perform these roles [e.g., Patton and Baker (1987), Johnson (1990)]. Boards are typically composed of a combination of employee (inside) directors and nonemployee (outside)

directors.[1] Board independence and effectiveness in monitoring top management are assumed to improve when the board is composed of a higher proportion of outside directors [Bacon (1990), Rechner (1989), Johnson (1990)]. A number of studies have found empirical evidence of a board composition effect on firm performance [e.g., Baysinger and Butler (1985)], on the likelihood of chief executive turnover [Weisbach (1988)], and on the ratification and monitoring of important decisions, such as the adoption of poisons pills [e.g., Brickley, Coles, and Terry (1994)] and acquisitions [e.g., Byrd and Hickman (1992)].

The effect of board composition on essentially all of the generally accepted roles of the board of directors have been investigated in the board composition literature except the role of evaluating and rewarding the top executives. This function is most often accomplished through management compensation plans, which are designed to align management interests with those of shareholders by linking rewards with performance. The board's effectiveness in this role has been investigated indirectly in numerous studies that have found empirical evidence of a significant relationship between executive compensation and firm performance [e.g., Coughlan and Schmidt (1985), Murphy (1985), Antle and Smith

[1]The definition of outside directors is further refined in Chapters 2 and 3.

(1986)]. In other studies, this link between compensation and performance, though significant, is sometimes considered weak or ambiguous [e.g., Kerr and Bettis (1987)]. Neither the board composition studies nor the pay-performance studies have considered the effect of the composition of the board on the relationship between executive compensation and firm performance. Although Mangel and Singh (1993) and Mallette, Middlemist, and Hopkins (1995) failed to find a board composition effect on the level of chief executive compensation, they did not investigate the effect of board composition on the pay-performance relationship.

The purpose of this study is to investigate the effect of board composition first on the relationship between executive compensation and firm performance and then on the type of performance measures, accounting or stock returns, used in the pay-performance relationship. If increasing the proportion of outside directors improves board effectiveness, as critics suggest and evidence from board composition studies supports, then the association between compensation and firm performance is likely to be stronger when the board is composed of a majority of outside directors. The evidence in this study supports this hypothesis when the performance measures are stock returns. Results reveal that the association between compensation and performance is significantly stronger for outsider-dominated

boards when the performance measure is excess returns, and marginally stronger when the performance measures is market-adjusted returns. No evidence is found, however, of a stronger association between compensation and accounting measures of performance when the board is dominated by outside directors.

Board composition is also hypothesized to have an effect on the performance measures used in the pay performance relationship. If outside directors are advocates for shareholders, who are interested in maximizing firm equity value, then outsider-dominated boards are likely to use stock return measures of performance in addition to, or instead of, accounting measures in the pay-performance relationship. Contrarily, inside directors are likely to prefer accounting measures of performance because, as members of management, they have more control over the elements underlying accounting measures than stock returns [Sloan (1993)]. The evidence in this study reveals that outsider-dominated boards use both accounting and stock return measures of performance whereas insiders focus on accounting measures in the pay-performance relationship.

The findings of this study imply that outside directors represent the interests of shareholders by linking executive compensation with stock return measures as well as accounting measures of performance. These results are

consistent with the conclusions of other board composition studies that outside directors play an important role in the corporate governance process.

In Chapter 2, the research questions for this study are developed in the context of a review of the relevant literature on board composition and the literature on the compensation-performance relationship. The research questions are formed into testable hypotheses in Chapter 3. The research design and methodology used to test the hypotheses, as well as variable definitions and data sources, are presented in Chapter 4. The results of the statistical analyses are discussed in Chapter 5. Finally, Chapter 6 contains a summary of the study and the conclusions drawn from the results, as well as a discussion of the limitations of the study and the implications for future research.

CHAPTER 2

LITERATURE REVIEW

Agency Theory and the Board of Directors

From an agency theory perspective [Jensen and Meckling (1976), Fama (1980), Fama and Jensen (1983)], managers who do not own a substantial portion of the firm's stock act as agents on behalf of the shareholders (principals). Agency problems arise because managers who do not own a substantial portion of the firm's stock do not bear a major share of the effects on shareholder wealth of their actions. In seeking to maximize their own utility, managers may shirk or overconsume perquisites and may not always seek to maximize firm equity value in the best interests of shareholders. This separation of decision and risk-bearing functions in a firm results in the need for some form of monitoring and incentives to align managers' interests with those of shareholders and to encourage managers to make decisions

that maximize shareholder wealth.

Managerial monitoring is accomplished through a number of avenues, including the managerial labor market, the takeover market, the stock market, and the board of directors of the corporation [Fama (1980), Fama and Jensen (1983), Mace (1986)]. The board of directors has generally been viewed as having primary responsibility for the monitoring function, with the external monitoring methods acting to influence the board or as a "court of last resort" [Fama and Jensen (1983)].

The Functions and Composition of the Board of Directors

Although state laws require corporations to be governed by a board of directors, there is little guidance as to the functions and composition of the board [Mace (1986), Baysinger and Butler (1985)]. The functions of the board of directors have thus been described in large part in the business literature. The generally accepted roles that the board of directors has traditionally performed in the corporate governance process have been described by Fama and Jensen [(1983), p. 311] as "the power to hire, fire, and compensate the top-level decision managers and to ratify and monitor important decisions."

Boards have been criticized, however, for not

fulfilling these roles and for allowing the chief executive officer to dominate the decision processes in the corporation [Mace (1986), Patton and Baker (1987), Johnson (1990), Rechner (1989)]. Based on field studies, interviews, and his personal observations as a director, Mace (1986) claims that boards do not exercise decision-making power or select the chief executive officer, except in crisis situations, but rather act in an advisory capacity. Also, according to Mace (1986), boards serve as a form of discipline merely because management must periodically present information to the board but do not challenge management by asking discerning questions.

Critics of board effectiveness have focused on board composition and director independence. With little guidance from state corporate laws, the composition of boards of directors has varied considerably in the proportions of inside and outside directors [Baysinger and Butler (1985)]. In general, inside directors have been defined as employees of the company whereas outside directors have been broadly defined as nonemployees of the company [Bacon (1990)].[2] Theoretically, the board should consist of inside as well as outside directors, although the optimal composition remains unspecified [Baysinger and Butler (1985)]. The rationale

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[2]The definition of outside directors is further refined in a later section.

for having inside directors on the board includes the firm-specific knowledge and information insiders provide and the opportunity to identify and groom a successor to the chief executive officer (CEO) [Fama (1980), Fama and Jensen (1983)].

Critics, however, have suggested increasing the number of outside directors on the board as a means of improving board effectiveness. Rechner (1989, p. 12) contends that outside directors have greater independence and that "increasing the representation of outside directors on the board will presumably result in improved board performance." Bacon (1990) also suggests that increasing the proportion of outside directors will increase the board's independence, and notes that the proportion of outside directors has been increasing for the past two decades.[3] Mace (1986) questions whether insiders can discipline the firm's management of which they are members or evaluate the CEO who is their boss. Mace (1986) also believes that the objectives underlying the reasons for including inside directors on the board may be accomplished by other means and that the board should consist entirely of outsiders

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[3]According to Bacon (1990), approximately half of the companies surveyed have boards with a majority of nonemployee directors. In Rosenstein and Wyatt's (1990) sample, the average composition of boards was 65.6% outside directors.

except for the CEO.

The independence of outside directors has also been questioned. Some critics claim that outside directors may still be more aligned with management than shareholders because management greatly influences the selection of directors and supplies the information for board analysis, and because outside directors typically own a trivial portion of the firm's stock [Mace (1986), Patton and Baker (1987), Johnson (1990)]. Others argue, however, that the market for director services and, more recently, the threat of lawsuits provide sufficient incentives for outside directors to represent shareholders [Fama (1980), Fama and Jensen (1983), McCarroll (1993)].

The independence of certain types of outside directors has also been questioned due to their potential conflicts of interest. For example, Mace (1986) notes that while directors who are retired or former employees of the company have traditionally been included in the outsider category, they may be more aligned with managers than shareholders due to their firm-specific knowledge and organizational loyalties that have developed over time. Baysinger and Butler (1985) also identify two other types of directors who have traditionally been classified as outsiders but who may have conflicts of interest that interfere with their independence. These types of directors include directors

related to management by blood or marriage and directors employed by organizations that conduct a significant amount of business with the firm. Examples of the latter type of directors include attorneys, investment bankers, consultants, commercial bankers, and officers and directors of major suppliers and customers of the company [Bacon (1990)].

A number of empirical studies have investigated whether the composition of the board has an effect on certain functions and decisions of the board. The empirical research provides some evidence in support of the critics' claims that increasing the proportion of outside directors on the board improves board effectiveness, although in some cases the results are mixed.

Empirical Research on Board Composition

Empirical research on board composition has focused on whether the proportion of outside directors on the board has an effect on firm performance, on the likelihood of CEO turnover, and on various decisions and monitoring by the board as evidenced by stock market reactions.

Effect on Firm Performance. One of the claims by critics is that having a higher proportion of outside

directors on the board should improve the performance of the board in discharging its generally accepted roles [e.g., Rechner (1989)]. Improved board performance should then, presumably, translate into improved firm performance. Several empirical studies have examined the effect of board composition on firm performance, with mixed results. Although Baysinger and Butler (1985) found no significant contemporaneous effect between board composition and firm performance, they did find a lagged effect between board independence in an earlier period and later firm performance. They concluded that the proportion of independent outside directors on the board was a potentially important variable in firm performance. Hermalin and Weisbach (1988) hypothesized that the lagged effect would occur in the opposite direction, that poor firm performance would be indicative of poor management and an increased need for managerial monitoring. They found evidence that poor firm performance leads to the appointment of more outside directors to the board. Schellenger et al. (1989) found a direct relationship between board composition and firm performance by identifying a significant positive correlation between the proportion of outside directors and risk-adjusted market returns. Kaplan and Reishus (1990) found indirect evidence of a relationship between firm performance and outside directorships. Their results

indicated that top executives of firms that reduced dividends, an indication of poor performance, were less likely to receive additional outside directorships on other firms' boards.

Not all of the empirical studies have found evidence of a relationship between board composition and firm performance. Using a sample of firms paired by industry and size but differing in the percentage of outside directors,[4] Fosberg (1989) compared various performance measures between the paired firms, including sales, number of employees, selling, general, and administrative expenses, and return on equity. Except for the sales to total assets ratio, Fosberg (1989) found no significant differences in the various performance measures between the paired firms. Hermalin and Weisbach (1991) also found no significant relationship between board composition and firm performance as measured by Tobin's q.[5] Their results were similar when using an earnings-based measure of performance in place of Tobin's q. Hermalin and Weisbach (1991) gave three possible

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[4]Fosberg (1989) used the broad definition of outside directors as nonemployees of the firm and did not attempt to identify outsiders with potential conflicts of interest. This could tend to overstate the percentage of independent outside directors.

[5]Tobin's q is the ratio of the market value of a firm's assets to their replacement cost [Hermalin and Weisbach (1991), p. 104].

explanations for their findings. (1) Outside directors do no better than insiders at representing shareholders' interests. They admit, however, that this is not consistent with the findings of other empirical studies. (2) If the combination of insiders and outsiders on the board is optimal, no relation between board composition and performance would be expected in equilibrium. This would not be inconsistent with other studies because other studies have focused on extraordinary events rather than daily monitoring. (3) If agency problems of all firms have been reduced to the same level of residual agency, and residual agency problems are deterministic of performance, the variation in performance will be uncorrelated with underlying actions to reduce agency problems.

Effect on CEO Turnover. One of the generally accepted roles of the board identified previously is the hiring and firing of the CEO. Weisbach (1988) investigated this role by examining whether the composition of the board had an effect on the likelihood of CEO turnover. Using logistic regression, Weisbach (1988) found a stronger relation between poor performance and the probability of CEO turnover for firms with outsider-dominated boards than for firms with insider-dominated boards. Similar results were obtained when the performance variable was return on the firm's stock

less a market return and when an accounting earnings measure was used as the performance variable. In addition, Weisbach (1988) found a significant positive relation between prior performance and excess stock returns surrounding the announcement of CEO resignation for firms with outsider-dominated boards whereas no such relation was found for firms with insider-dominated boards.

Effect on Decisions. Another generally accepted board responsibility is the ratification and monitoring of important decisions. Several empirical studies have examined the effect of the composition of the board on the stock market reactions to various decisions and events. Rosenstein and Wyatt (1990) found that significant positive excess returns accompanied the appointment of an outside director to the board, even though most boards were dominated by outsiders prior to the appointment. They concluded that, on average, outside directors are chosen in the shareholders' interests.

Empirical evidence of a board composition effect was also obtained from the adoption of poison pills, a decision made by the board of directors without shareholder approval that can potentially benefit or harm shareholders. Brickley, Coles, and Terry (1994) found a significant positive relation between the stock market reaction to

poison pill adoption and the percentage of outside directors. They also found that the average stock price reaction to poison pill adoptions was significantly positive when the board was dominated by outsiders and significantly negative when it was not outsider-dominated. Mallette and Fowler (1992), however, did not find support for their hypothesis of an inverse relationship between the proportion of independent outside directors and the probability of a poison pill adoption by the board of directors. One possible reason for the difference in the findings of these studies may be that Mallette and Fowler (1992) viewed all adoptions of poison pills as being harmful to shareholders whereas Brickley, Coles, and Terry (1994) assumed that the adoption of poison pills may potentially benefit as well as harm shareholders.

Several other empirical studies address the effect of board composition on acquisitions. According to Byrd and Hickman (1992), the equity value of the bidding firm may be enhanced or reduced by a tender offer. They hypothesized that there would be a positive association between the returns to shareholders of bidding firms in tender offers and the proportion of independent outside directors. Their analysis revealed that the average abnormal return for a two-day window surrounding the announcement of the acquisition bid was significantly less negative when

independent outside directors comprised at least half of the bidding firm's board.

Brickley and James (1987) studied acquisitions in banking, an industry in which takeovers are regulated by the states. Brickley and James (1987) hypothesized that, if the takeover market and board of directors were substitutes for one another in monitoring management, banks in states that do not allow acquisitions should have a higher proportion of outside directors on their boards. They found, however, that the percentage of outside directors was actually lower in nonacquisition states than in acquisition states, although the difference was not significant. One possible explanation for their finding is that managers may have less incentive for putting outsiders on the board without the threat of takeover in nonacquisition states, whereas in acquisition states, managers would rather be monitored by outside directors of their own choosing than the takeover market. Brickley and James (1987) did find, however, that outsider-dominated boards and stock ownership concentration helped control managerial consumption of perquisites.

According to the disciplinary theory of takeovers, hostile takeovers occur when the board of directors is ineffective in performing its functions [Shivdasani (1993)]. In Shivdasani's (1993) study, the percentage of outside directors on the board, outside director stock ownership,

and the number of additional outside directorships held by outside directors were all used as measures of board effectiveness. Shivdasani (1993) found that the percentage of outside directors had no significant effect on the likelihood of hostile takeovers but stock ownership by outside directors and additional outside directorships were significant, especially for independent outside directors.

Summary. Taken together, the studies discussed in this section provide empirical evidence that the composition of the board has some effect on firm performance, the likelihood of CEO turnover, and the monitoring of managerial decisions. These findings provide support for critics' claims that increasing the proportion of outsiders improves board effectiveness.

Board Composition and CEO Compensation

Another generally accepted role that the board has traditionally performed is the evaluation and compensation of top management. This function is most often fulfilled through management compensation plans, which are designed to align the interests of management with those of shareholders by rewarding managers based on performance. Mangel and Singh (1993, p. 339) call executive compensation "an

important instrument of corporate governance and an indicator of its effectiveness." In their study, Mangel and Singh (1993) hypothesized that a higher percentage of outside directors on the board would result in less CEO compensation. They did not, however, find a significant relationship between the percentage of outside directors on the board and the level of CEO compensation. Mallette, Middlemist, and Hopkins (1995) likewise hypothesized that (1) a higher percentage of independent outside directors would correspond with a lower level of CEO cash compensation, and (2) a higher percentage of inside directors would correspond with a higher level of CEO cash compensation. They found no support for either of these hypotheses, but did find that CEO tenure and CEO stockholdings were significant determinants of CEO cash compensation. Although Mangel and Singh (1993) discuss the importance of a strong pay-performance relationship, both Mangel and Singh (1993) and Mallette, Middlemist, and Hopkins (1995) investigated the effect of board composition on the level of CEO compensation rather than the relationship between CEO compensation and firm performance.

There is an impressive body of literature that investigates indirectly the board's role of evaluating and rewarding top management by examining the relationship between CEO compensation and firm performance. This

empirical literature, discussed in the next section, provides some evidence of board effectiveness in evaluating and rewarding managers by documenting a significant relationship between CEO compensation and firm performance, although in some cases this relationship is weak. These studies have not, however, considered the effect of the composition of the board on the pay-performance relationship.

Literature on Executive Compensation and Firm Performance

Executive Compensation Plans. Executive compensation plans are one of the primary tools used by boards of directors to align the interests of management with those of shareholders [Butler and Maher (1986)]. These plans are designed to reward managers based on performance and generally include a combination of salary, bonus, and long-term incentives.[6,7] Bonuses are typically annual awards made to reward managers for short-term performance based on profits [Arreglado (1990), p. 17]. According to the

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[6]See Butler and Maher (1986), Kaplan and Atkinson (1989), and Paulin (1989) for a description of the types of management compensation.

[7]One survey (Bennett, 1987) estimates the components of compensation for chief executives of large companies in 1986 to be 46% salary, 26% annual bonus, and 28% long-term incentives.

Conference Board's survey [Arreglado (1990)], the existence of annual bonus plans is prevalent among the surveyed firms, ranging from 100% of the communications firms to 87% of the utility firms.[8]

Long-term incentives include stock options and stock appreciation rights, deferred cash or restricted stock, and performance shares or units.[9] These incentives are designed to encourage managers to focus on long-term performance and firm value in an effort to align managers' interests with those of shareholders. The value of stock-based incentives as a valid performance measure has been criticized, however, because many other factors outside the control of management affect stock price, such as the state of the economy. Another criticism, particularly of stock options, is that managers may potentially receive a reward when the stock price rises, but there is no downside risk for poor performance [Crystal (1988)].[10] Also, stock

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[8]The majority of the firms in the survey were in manufacturing. Of the manufacturing firms, 95% had an annual bonus plan.

[9]Long-term incentives are discussed in a series of articles in Compensation and Benefits Review. See Paulin (1989), Graskamp (1989), Aisenbrey (1989), Kanter and Ward (1990) and Chingos (1990).

[10]Stock options lack downside risk because if the stock price falls below the exercise price, the CEO may choose to let the options expire rather than exercise them or, in many cases, the company may allow the options to be swapped for new options with a lower exercise price.

ownership in general may lead managers to make overly conservative business decisions because their investment risk, in terms of both stock ownership and human capital, cannot be diversified as readily as that of other shareholders.[11]

The compensation that chief executive officers receive has been criticized in the business literature as being excessive, particularly when their firms are performing poorly. As Loomis (1982, p. 42) states, "In a totally rational world, top executives would get paid handsomely for first-class performance, and would lose out when they flopped. But to an extraordinary extent, those who flop still get paid handsomely." Crystal, a former executive compensation consultant and outspoken critic of CEO compensation, remarks that, "With a few notable exceptions, the CEOs suffer little or not at all no matter what happens to the company." [Crystal (1988), p. 62] In these criticisms, firm performance is typically some measure of profit, such as earnings per share or return on equity, or shareholder stock returns. [See Crystal (1991a).] These criticisms imply that boards have not been effective in monitoring the CEO through the compensation plan.

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[11]See Kaplan and Atkinson (1989), pp. 722-723.

Empirical Research on Management Compensation and Firm Performance. Numerous empirical studies have examined the relationship between management compensation and firm performance. Some studies have found a favorable market reaction to the adoption of different types of compensation plans [e.g., Brickley, Bhagat, and Lease (1985), Tehranian and Waegelein (1985)]. Others, discussed below, have attempted to establish a direct link between compensation and performance, using various definitions of compensation and performance, with mixed results.[12]

Coughlan and Schmidt (1985) found a significant, positive relation between pay and stock price performance for executives under 64 years of age by regressing the change in CEO salary plus bonus against cumulative abnormal returns. They noted, however, that the R-square was low, indicating that little of the variation in salary plus bonus was explained by the stock price performance. They also found, using logistic regression, that stock price was inversely related to the probability of management turnover. Their conclusion overall was that boards make compensation and management termination decisions related to the firm's stock price performance. Murphy (1985) extended the

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[12]See Pavlik, Scott, and Tiessen (1993) for a more comprehensive review of the literature on executive compensation.

definition of the compensation variable to include an estimate of deferred compensation and the value of stock options in addition to salary and bonus. Using time-series regression, Murphy (1985) found that firm performance, measured as the return realized by the firm's shareholders and alternatively as the growth of firm sales, was strongly and positively related to management compensation.

Antle and Smith (1986) examined whether executive compensation was related to performance, measured as a firm's accounting profits evaluated relative to average profitability of firms in the same industry. They found weak support for their hypothesis. Gibbons and Murphy (1990) also explored relative performance evaluation with performance defined as the rate of return received by a firm's shareholders relative to the industry and market return. They found evidence of a relation between performance and compensation, although they concluded that performance is more likely to be evaluated relative to the market than to the firm's industry.

Taken together, these studies provide some evidence of a link between management compensation and performance. The research in this area, however, is by no means conclusive. Jensen and Murphy (1990) found that while changes in pay-related wealth and value of stockholdings of CEOs were positively and significantly related to changes in

stockholder wealth, the magnitude was small in terms of implied incentives.[13] This, they say, implies that "the amount of income 'at risk' for poor performance is a trivial percentage of the CEO's total income" [Jensen and Murphy (1990), pp. 242-244]. Baker, Jensen, and Murphy (1988) have argued that firms do not use pay-for-performance even though they claim to, based on evidence showing little difference between managers' pay levels and performance ratings, use of promotion-based incentive systems, and the general reluctance of employers to fire or give poor performance evaluations to employees.

Kerr and Bettis (1987) argued that the findings of Coughlan and Schmidt (1985) and Murphy (1985), while statistically significant, were small in magnitude and ambiguous, particularly Murphy's result that firms with a negative 30% return still had a 6.8% increase in total pay. They then tested the relation between salary and bonus and performance measured as cumulative abnormal returns, with no significant results. Bentson (1985) also reported finding no relation between management compensation and firm performance. In a questionnaire survey regarding managers at various levels, Leonard (1990) found the elasticity of

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[13]For a CEO with median holdings, CEO wealth changes $3.25 for a $1,000 change in stockholder wealth and CEO total compensation changes $0.033 for a $1,000 change in stockholder wealth.

salary and bonus with respect to sales and profits to be low, although the elasticity was higher for the CEO than for lower levels of management.

Various definitions of compensation and performance have been used in these studies. Compensation has included various combinations of salary and bonus, deferred compensation, and stock options. Consistent with many prior studies [e.g., Coughlan and Schmidt (1985), Lambert and Larcker (1987), Gibbons and Murphy (1990)], this study focuses on CEO salary and bonus compensation. Financial performance measures used in prior research have typically included accounting measures, such as earnings or return on assets or equity, or stock return measures, such as market-adjusted or abnormal returns. Studies comparing accounting measures and stock return measures of performance [e.g., Antle and Smith (1986), Janakiraman, Lambert, and Larcker (1992), and Sloan (1993)] have found that compensation is more strongly related to accounting measures than stock return measures. See Table 1 for a summary of the empirical literature on executive compensation and firm performance.

Explanations for the Weak Pay-Performance Relationship. Several theories have been suggested to explain the sometimes weak link between CEO compensation and performance. Ungson and Steers (1984) have posited that a

Table 1

Empirical Research on Management Compensation and Firm Performance

Journal Article	Compensation Measure(s)	Performance Measure(s)	Findings
Coughlan, Schmidt (1985)	Change in salary plus bonus	Cumulative abnormal returns; sales growth	Positive relation between salary plus bonus and stock price performance. Sales growth was not significant when included with stock returns.
Murphy (1985)	Salary plus bonus, deferred compensation, value of stock options	Common stockholder return, sales growth	Shareholder return and sales growth are positively and significantly related to total compensation and salary plus bonus.
Bentson (1985)	Salary plus bonus	Shareholder returns	No support for self-serving hypothesis (that managers take actions that increase firm size so pay increases in spite of losses to shareholders). Managers' gains or losses from stock holdings far exceed changes in compensation.
Lambert, Larcker (1987)	Change in salary plus bonus	Change in ROE, market return	Compensation has strong positive time-series relation with ROE but modest relation with market returns
Kerr, Bettis (1987)	Change in salary plus bonus	Abnormal returns	No significant association between change in CEO pay and abnormal returns

Table 1 (Continued)

Empirical Research on Management Compensation and Firm Performance

Journal Article	Compensation Measure(s)	Performance Measure(s)	Findings
Antle, Smith (1986)	Current income equivalents (est. worth of salary, bonus, stock holdings and options, deferred compensation, dividend units, performance plans, etc.)	Return on common stock, accounting return on assets	Results are mixed. Some evidence that executives are compensated based on accounting profits relative to firms in same industry. Results more robust for accounting than stock return measures.
Gomez-Mejia, Tosi, Hinken (1987)	Salary plus bonus, long-term incentives	Scale (index of various measures), Performance (index of various measures)	Managers of owner-controlled firms were compensated more for performance while those of manager-controlled firms were compensated more for scale.
O'Reilly, Main, Crystal (1988)	Salary plus bonus	ROE, Firm size (sales, assets, # of employees)	Compensation weakly associated with size and profitability. Strong association between CEO pay and pay of outside directors.
Leonard (1990)	Salary plus bonus	Change in sales, change in profits, hierarchical position	Pay strongly determined by level in corp. hierarchy. Low elasticity of pay to sales or profits, but higher for CEO than lower levels of mgmt.
Gibbons, Murphy (1990)	Salary plus bonus	Return on common stock; market and industry stock returns	Change in CEO pay positively related to shareholder returns. Performance is more likely to be evaluated relative to market than industry.

Table 1 (Continued)

Empirical Research on Management Compensation and Firm Performance

Journal Article	Compensation Measure(s)	Performance Measure(s)	Findings
Jensen, Murphy (1990)	Salary plus bonus, value of stock options, value of CEO stockholding, dismissal-related wealth loss	Return on common stock	Magnitude of relation between CEO wealth and stockholder wealth is small.
Kerr, Kren (1992)	Cash compensation (salary, bonus, deferred amounts), stock options	Return on assets (ROA), firm market return, industry return	When decisions were "unique" (relative to industry), both ROA and returns were related to cash compensation. No significant relation found when including stock options in compensation.
Janakiraman, Lambert, Larcker (1992)	Change in salary plus bonus	Change in ROE, market return (RET)	CEO compensation positively related to firm's ROE and return, but not to industry ROE and negatively related to industry return. Level of explanatory power lower for RET than ROE.

CEO is compensated as a political figurehead and strategist, which are difficult to evaluate using objective measures of performance. A tournament theory has been suggested by O'Reilly et al. (1988) in which vice presidents in a firm give up part of their expected salary associated with their individual performance in order to compete for the "prize" of being promoted to CEO and receiving the CEO's salary. They fail, however, to find empirical evidence to support this theory. Baker et al. (1990) suggested a similar theory in that promotions are used as incentives for lower level managers, and compensation is tied to job level rather than individual performance; however, promotions are not useful as an incentive for CEOs. Crystal (1991a, p. 254-256) disagrees with the tournament theory because he has found that if the CEO is paid above the market, other senior executives in the same firm are as well.

Another explanation suggested by O'Reilly et al. (1988) is the social comparison theory. Because the compensation committee of the board of directors, who set the CEO's pay, is typically made up of outside directors who are CEOs of other firms, they are likely to use their own pay as a standard of comparison. O'Reilly et al. (1988) found empirical support for this theory. Mallette, Middlemist, and Hopkins (1995) likewise found that compensation committee members' own pay was a significant determinant of

CEO cash compensation. Fierman (1990) and Crystal (1991a) have argued that CEO pay is set based on rank rather than individual performance, and because firms want to be on the high side of median compensation for the industry in order to be competitive, the median is thus raised. Fizel, Louie, and Mentzer (1990) have made the argument that CEO compensation is exogenously determined by the labor market and not firm performance, reducing the firm's reward structure for good/poor performance to retaining/terminating the CEO.[14]

The firm's ownership structure may also affect the association between firm performance and management compensation and CEO turnover. Salancik and Pfeffer (1980) found weak evidence that executive tenure is least affected by poor performance in owner-managed firms (in which the manager owns at least 4% of the stock) and most affected in externally-controlled firms (in which an outside investor owns at least 4% of the stock). Gomez-Mejia et al. (1987) designated a firm as "owner-controlled" if a single investor not involved in management owns at least 5% of the stock and "manager-controlled" otherwise. They found a stronger relation between performance and compensation for owner-

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[14]The probability of turnover when firm performance is poor, however, is still not very high [Weisbach (1988), Coughlan and Schmidt (1985)].

controlled firms than for manager-controlled firms, and a significant relation between firm size and compensation for manager-controlled firms. Using a questionnaire survey of chief compensation officers, Tosi and Gomez-Mejia (1989) found that there is less monitoring[15] and the CEO is most influential in setting CEO compensation in management-controlled firms, whereas boards are most influential and CEOs least influential in determining CEO compensation in owner-controlled firms. Pavlik and Belkaoui (1991) developed a complex path analysis model, the results of which suggest that "ownership structure...affect(s) executive compensation directly and indirectly through the mediator of firm performance" [p. 131].

Board Composition and the Pay-Performance Relationship

Another possible explanation for the mixed and sometimes weak results in the pay-performance literature is that boards of directors differ in their effectiveness in evaluating and rewarding the CEO through the compensation

[15]Monitoring is measured by a composite index of responses to items in the survey questionnaire dealing with the process used in the firm to determine CEO compensation. See Tosi and Gomez-Mejia (1989, p. 176).

plan.[16] This difference in board effectiveness may be due to the composition of the boards of directors. Mace (1986) has questioned whether inside directors can objectively evaluate the chief executive who is their superior. Also, Crystal (1991a) has found that if the CEO's pay is above the market, the pay of other senior executives will be as well. This would imply that inside directors have a vested interest in ensuring that the CEO is rewarded well regardless of firm performance. On the other hand, outside directors may be more independent and, therefore, more effective in evaluating and rewarding the CEO through the compensation plan. Baysinger and Hoskisson (1990) have proposed that, because outside directors have limited exposure to the day-to-day operations of the firm, independent outside directors will choose to evaluate and reward top management "on the basis of objective financial performance criteria." Inside directors, according to Baysinger and Hoskisson (1990, p. 79), will use a "subjective appraisal of the quality of the process leading

[16]Although the compensation plan is generally developed by the compensation committee, which is usually composed primarily of nonemployee directors, the board as a whole would certainly influence and ratify the plan.

to financial performance outcomes."[17]

The board composition literature, discussed previously, provides some evidence that increasing the proportion of independent outside directors on the board improves board effectiveness. Again, Fama and Jensen [(1983), p. 311] have described the generally accepted roles of the board as "the power to hire, fire, and compensate the top-level decision managers and to ratify and monitor important decisions." The effect of board composition on virtually all of these generally accepted board roles has been explored in the board composition literature except for the compensation role. Mangel and Singh (1993) and Mallette, Middlemist, and Hopkins (1995) investigated the effect of board composition on the level of CEO compensation but not on the relationship between CEO compensation and firm performance. The effect of the composition of the board has likewise not been considered in the literature on CEO compensation and firm performance. The question then remains: If a higher proportion of outside directors results in improved board effectiveness, as critics claim and empirical research

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[17]Baysinger and Hoskisson (1990) imply that insiders actually do a better job of evaluating top management performance than outsiders because they have "greater access to subjective information" regarding the "quality of their decision processes." Inside directors, however, are members of top management (Bacon, 1990), so it seems that they would be subjectively evaluating their own performance.

supports, will there then be a stronger relationship between CEO compensation and firm performance for firms with a higher proportion of outside directors on their boards? This is the first empirical question to be investigated in this study.

A corollary question is, will the composition of the board make a difference in the performance measures used to evaluate and reward top management? Empirically, both accounting measures and stock return measures have been used as performance measures in the pay-performance literature.[18] In several studies, the pay-performance relationship was found to be stronger for accounting measures than for stock return measures of performance. Antle and Smith (1986) found that their results were more robust for accounting measures than for market-based measures of performance. Lambert and Larcker (1987) and Janakiraman, Lambert, and Larcker (1992) both found a stronger association between the change in CEO cash compensation and the accounting measure of performance than the stock return measure of performance. However, these studies did not consider the potential effect of the composition of the board on the performance measures used.

Compensation plans are ostensibly designed to align the

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[18]See Table 1 for a summary of performance measures used in the pay-performance studies.

interests of management with those of shareholders. If the objective of shareholders is the maximization of firm equity value, it would seem that stock return measures of performance should be more prevalent in compensation plans. However, components of compensation, such as bonuses and long-term performance plans, are typically linked to some measure of accounting earnings [Arreglado (1990)]. One of the most common reasons given for the prevalence of accounting measures in compensation contracts is that executives have more control over accounting measures than stock return measures. Sloan (1993) investigated the role of accounting earnings in compensation plans and concluded that one reason for using accounting earnings in compensation plans is to shield executive compensation from market-wide fluctuations in firm equity values. Inside directors, as members of management, may thus prefer to use accounting measures of performance for evaluation because they have more control over the accounting measures than stock return measures. If outside directors are advocates for shareholders, and shareholders are interested in maximizing firm equity value, outside directors may be more likely to use stock measures of performance in addition to, or instead of, accounting measures of performance.

These research questions are developed into testable hypotheses in the next chapter.

CHAPTER 3

HYPOTHESES

The research questions posed in the preceding chapter are developed into three sets of hypotheses. The first set of hypotheses is tested to establish the pay-performance link for firms with boards dominated by outside directors.[19] The first research question, regarding whether boards with a higher proportion of outside directors are more effective in monitoring CEO compensation, is formulated into the second set of hypotheses. Finally, the third set of hypotheses is developed to explore the question of whether the composition of the board makes a difference in the performance measures used to evaluate and reward top management. All hypotheses are expressed in alternative form.

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[19]Outsider-dominated boards are defined in the next chapter as boards having greater than fifty percent outside directors.

Hypotheses Regarding the Pay-Performance Relationship for Outsider-Dominated Firms

Empirical evidence of a significant positive relationship between executive compensation and firm performance is well established in the literature discussed in the preceding chapter.[20] Before exploring the research questions for this study, it was considered prudent to establish that there is a significant positive relationship between pay and performance for outsider-dominated boards, consistent with prior research. Because the level of compensation includes a fixed amount regardless of performance, pay is defined in the next chapter as the change in CEO compensation. The first hypothesis is expressed formally as follows:

H_1: There is a significant positive relationship between the change in CEO compensation and performance for firms with outsider-dominated boards.

Four measures of performance are defined in the next chapter. These measures include two accounting measures and two stock return measures. The accounting measures include the percentage change in earnings and change in earnings weighted by common equity. The two stock return measures are market-adjusted returns and excess returns. Therefore,

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[20]See Table 1 in Chapter 2 for a summary of the literature on executive compensation and firm performance.

Hypothesis 1 is expressed for each performance measure as follows:

H_{1a}: There is a significant positive relationship between the change in CEO compensation and the percentage change in earnings for firms with outsider-dominated boards.

H_{1b}: There is a significant positive relationship between the change in CEO compensation and the change in earnings weighted by common equity for firms with outsider-dominated boards.

H_{1c}: There is a significant positive relationship between the change in CEO compensation and market-adjusted returns for firms with outsider-dominated boards.

H_{1d}: There is a significant positive relationship between the change in CEO compensation and excess returns for firms with outsider-dominated boards.

Hypotheses Regarding Board Composition

The first research question posed in the preceding chapter deals with the effect of the composition of the board of directors on the relationship between executive compensation and firm performance. While the existence of a significant positive relationship between compensation and performance has been established in the literature, these studies have not considered the potential effect of the composition of the board on the pay-performance relationship. In the discussion in the preceding chapter,

the composition of the board was found to have some effect on firm performance [e.g., Baysinger and Butler (1985)], the likelihood of CEO turnover [Weisbach (1988)], and the ratification and monitoring of important decisions [e.g., Brickley, Coles, and Terry (1994), Byrd and Hickman (1992)]. These studies provide evidence in support of critics' claims that increasing the proportion of outside directors improves board effectiveness. Virtually all of the generally accepted board roles of hiring, firing, and compensating top management and ratifying and monitoring important decisions [Fama and Jensen (1983)] have been investigated in the board composition studies. One role that has not been adequately studied, however, is that of evaluating and rewarding the chief executive. While two studies, Mangel and Singh (1993) and Mallette, Middlemist, and Hopkins (1995), failed to find a board composition effect on the level of CEO compensation, none of these studies has examined the effect of the board composition on the relationship between compensation and firm performance. If a higher proportion of outside directors results in improved board effectiveness, as critics claim and empirical research supports, the relationship between CEO compensation and firm performance is likely to be stronger for firms with a greater proportion of outside directors on their boards. In addition, outside directors may be more likely than inside directors to rely

on objective financial measures of performance [Baysinger and Hoskisson (1990)], which would also imply a stronger association between pay and performance for firms with outsider-dominated boards. For purposes of this study, outsider-dominated boards are defined in the next chapter as those boards with greater than fifty percent outside directors. This hypothesis is formally expressed below:

H_2: There is a stronger association between the change in CEO compensation and performance when the board is dominated by outside directors than when the board is insider-dominated.

This hypothesis is also expressed for each of the four performance measures as follows:

H_{2a}: There is a stronger association between the change in CEO compensation and the percentage change in earnings when the board is dominated by outside directors than when the board is insider-dominated.

H_{2b}: There is a stronger association between the change in CEO compensation and the change in earnings weighted by common equity when the board is dominated by outside directors than when the board is insider-dominated.

H_{2c}: There is a stronger association between the change in CEO compensation and market-adjusted stock returns when the board is dominated by outside directors than when the board is insider-dominated.

H_{2d}: There is a stronger association between the change in CEO compensation and excess returns when the board is dominated by outside directors than when the board is insider-dominated.

Hypotheses Regarding Performance Measures

The second research question posed in the preceding chapter deals with the effect of the composition of the board on the type of performance measures used in evaluating and rewarding the top executive. While a stronger association between compensation and accounting measures of performance than between compensation and stock return measures has been found in some studies [e.g., Lambert and Larcker (1987), Janakiraman, Lambert, and Larcker (1992)], these studies have not considered the composition of the board. In investigating the role of accounting earnings in compensation contracts, Sloan (1993) found that "earnings-based incentives help shield executives from market-wide factors in stock prices." As members of management, inside directors may prefer to be evaluated based on accounting measures of performance because they have more control over accounting measures than stock returns. Shareholders, however, are interested in maximizing firm equity value. As advocates for shareholders, outside directors may then use stock measures of performance in addition to, or instead of, accounting measures of performance. Thus, the two groups may differ in the type of performance measures emphasized in the pay-performance relationship. This hypothesis is expressed as follows:

H_3: Outsider-dominated and insider-dominated boards differ in the type of performance measure, accounting and stock return, emphasized in the relationship between the change in CEO compensation and firm performance.

This hypothesis is expressed for each combination of accounting and stock return performance measures as follows:

H_{3a}: Outsider-dominated and insider-dominated boards differ in the type of performance measure, percentage change in earnings and market-adjusted returns, emphasized in the relationship between the change in CEO compensation and firm performance.

H_{3b}: Outsider-dominated and insider-dominated boards differ in the type of performance measure, percentage change in earnings and excess returns, emphasized in the relationship between the change in CEO compensation and firm performance.

H_{3c}: Outsider-dominated and insider-dominated boards differ in the type of performance measure, change in earnings weighted by common equity and market-adjusted returns, emphasized in the relationship between the change in CEO compensation and firm performance.

H_{3d}: Outsider-dominated and insider-dominated boards differ in the type of performance measure, change in earnings weighted by common equity and excess returns, emphasized in the relationship between the change in CEO compensation and firm performance.

The research design and methodology used to test these hypotheses, including variable definitions and data sources, are presented in the next chapter.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

The hypotheses stated in the previous chapter are tested using regression analysis. In the regression model, the change in CEO compensation is expressed as a function of performance, board composition, and several variables to control for ownership structure, growth, firm size, CEO entrenchment, dual leadership, and interlocking directorships. The variables used in the model are defined in the next section, followed by a formal expression of the model. Finally, data sources are described.

Variable Definition

Compensation

Because the level of CEO compensation includes a fixed

amount regardless of performance, the change in CEO compensation is more likely to be associated with performance than is the level of CEO compensation. The change in CEO compensation is defined as one plus the percentage change in CEO salary and bonus, calculated as the salary and bonus compensation for a given year divided by the prior year salary and bonus.[21] The compensation variable used in the analysis (CHGPAY) is defined as the natural log of the change in CEO salary and bonus compensation:[22]

$$CHGPAY = Ln\{(Salary_t+Bonus_t)/(Salary_{t-1}+Bonus_{t-1})\} \quad (1)$$

Long-term incentives, while an important component of management compensation, are not included in the variable definition of CEO compensation. Of the components of compensation, Murphy (1985) found that salary and bonus were strongly related to performance whereas stock options, valued using the Black-Scholes model, were negatively

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[21]Because the salary for a succeeding year (t+1) would presumably be determined by the board based on the performance in a given year (t), it would be preferable to match the bonus for year t with the salary for year t+1. The SEC, however, requires only that the sum of salary and bonus be reported, not the respective components. Likewise, the Forbes surveys from which the salary and bonus data were obtained reports only the sum of salary and bonus. Therefore, reported salary and bonus is used, consistent with prior studies.

[22]The natural log is used to make percentage decreases comparable with percentage increases.

related to performance. Kerr and Kren (1992) reported significant results for models using cash compensation as the dependent variable but not for models in which the dependent variable was cash compensation plus stock options. They concluded that options may not be a reward for past performance but may instead be intended to provide future incentives to managers to increase shareholders' wealth [Kerr and Kren (1992), p. 392-393]. Therefore, salary and bonus is used in the computation of the compensation variable in this study, consistent with most prior research.

Performance Measures

Because a variety of performance measures were used in previous studies,[23] the performance variables used in this study include two accounting measures and two stock return measures. The two accounting measures of performance include the percentage change in earnings before extraordinary items and discontinued operations and the change in earnings weighted by common equity. The two stock return measures of performance used in this study are market-adjusted returns and excess returns. Although the annual returns are calculated for fiscal years (e.g., 1988),

[23]See Table 1 in Chapter 2.

they actually represent the change in the value of the stock from the end of the preceding fiscal year to the end of the given year (e.g., 1987-1988). For this reason, returns are used as the stock performance measure rather than the change in the measure as is done with accounting performance measures.

Percentage Change in Earnings. Puffer and Weintrop (1991) suggest that boards evaluate management performance in relation to their expectations. Departures from expectations should then be reflected in the change in CEO compensation. As discussed in Hermalin and Weisbach (1988, p. 593), the literature on the time-series of accounting earnings describes earnings behavior as approximating a random walk [e.g., Ball and Watts (1972)], which suggests that the change in earnings may be a good proxy for unexpected earnings. The percentage change in earnings is used rather than the dollar amount of the change to control for size differences between firms. The percentage change in earnings (%EARN) is calculated as earnings before extraordinary items and discontinued operations of the current year ($IBEI_t$) less prior year earnings ($IBEI_{t-1}$), divided by the absolute value of prior year earnings:

$$\%EARN = (IBEI_t - IBEI_{t-1}) / |IBEI_{t-1}| \quad (2)$$

When prior year earnings are near zero, the percentage

change in earnings becomes large and problems occur in the data analysis. As more fully discussed in the next chapter, observations for which the percentage change in earnings is large are excluded from the analysis.

Change in Earnings Weighted by Common Equity. The change in earnings weighted by common equity is also used as an accounting measure of performance. This is similar to the change in return on equity measure used by Lambert and Larcker (1987). The change in earnings weighted by common equity is calculated as the change in earnings before extraordinary items and discontinued operations (IBEI) divided by average common stockholders' equity (CMEQ). The change in earnings is weighted by common equity to control for size differences between firms. Because the measure is similar to a return on equity, it will be referred to as CHGROE:

$$CHGROE = (IBEI_t - IBEI_{t-1}) / [(CMEQ_t + CMEQ_{t-1})/2] \quad (3)$$

Market-adjusted Returns. Consistent with Weisbach (1988) and Gibbons and Murphy (1990), market-adjusted returns are used as a stock measure of performance. The market-adjusted return (MRET) is the return on the firm's stock in year t, R_{it}, less the return on a value-weighted market portfolio, R_{mt}:

$$MRET = R_{it} - R_{mt} \quad (4)$$

Market-adjusted returns are used rather than industry-adjusted returns based on the finding by Gibbons and Murphy (1990) that CEO performance is more likely to be evaluated relative to aggregate market movements than to industry movements.

Excess Returns. Because Schellenger et al. (1989) found a positive correlation between the proportion of outside directors and risk-adjusted returns, excess returns (XRET) are used. Excess returns are calculated by the Center for Research on Securities Prices (CRSP) as the firm's return less the return for a portfolio of firms of similar beta.

Directors

Directors have traditionally been classified as inside directors if they are full-time employees of the firm or outside directors if they are not. Though not employees, some outside directors may potentially face conflicts of interest because of their relationship with the firm. According to Bacon (1990), these directors include officers and directors of major suppliers and customers of the company, and attorneys, investment bankers, consultants, and

commercial bankers who provide services to the company. Because of this potential conflict of interest, directors are classified in this study into three categories in a manner similar to that of Byrd and Hickman (1992). Inside directors include current and retired employees of the company and members of their families. Outside directors with potential conflicts of interest are classified as affiliated outside directors. The remaining outsiders, whose only apparent affiliation with the firm is their directorship, are classified as independent outside directors.

Byrd and Hickman (1992) defined an outsider-dominated board as one consisting of at least 50% independent outside directors. It may be argued, however, that outsiders would not dominate a board composed of exactly 50% outside directors. Therefore, an outsider-dominated board is defined in this study as having greater than 50% independent outside directors. The proportion of outside directors is calculated as the ratio of independent outside directors to the total number of directors on the board. The variable used to represent a board dominated by independent outside directors (OD) is a dichotomous variable set equal to one when the proportion of outside directors is greater than 50% and zero when the proportion is 50% or less.

Control Variables

Because a number of other factors have been found to affect the relationship between compensation and performance, several control variables are included in the analysis.

Growth. A positive link has been found in prior research between the level of CEO compensation and firm size [e.g., Murphy (1985), Gomez-Mejia et al. (1987), Pavlik and Belkaoui (1991)]. As the firm grows, therefore, CEO compensation would be expected to increase, resulting in a positive association between growth and the change in CEO compensation. This expectation is consistent with the findings of Murphy (1985) of a positive association between compensation and growth using time series regression. In Murphy (1985), the percentage change in sales was used as a proxy for growth. Similar to Murphy (1985), the growth variable (GRWTH) used in this analysis is the natural log of one plus the percentage change in net sales:

$$GRWTH = Ln(\text{Net Sales}_t \; / \; \text{Net Sales}_{t-1}) \qquad (5)$$

Ownership structure. As discussed in Salancik and Pfeffer (1980) and Gomez-Mejia et al. (1987), managers are likely to have less control in firms in which at least four

or five percent of stock is owned by an outside investor not involved in management. McCarroll (1993) contends that large investors put pressure on board members, causing them to take their job more seriously. Thus, the existence of at least one such large block shareholder would be expected to make the pay-performance relation stronger. The variable used for large block shareholders (LGSH) is a dichotomous variable set equal to one when at least one large investor not involved in management holds five percent or more of the company's common shares at the end of the year, and zero otherwise.

Stock ownership by the CEO may also affect the relationship between compensation and performance. Sloan (1993) suggests that, when CEO stock ownership is high, the strong link between CEO wealth and stock performance may mean that the association between cash compensation and earnings performance will be stronger in order to shield the CEO from market fluctuations. Contrarily, the board may consider the need for a link between CEO cash compensation and performance to be lessened when there is a strong link between CEO wealth and stock performance, resulting in a weaker association between pay and performance. Finally, Hermalin and Weisbach (1991) suggest that high levels of ownership may cause management to become more entrenched, which would imply a weaker association between compensation

and performance.

For this analysis, the variable to control for CEO stock ownership (CEOSTK) is a dichotomous variable set equal to one if CEO stock ownership is classified as "high" and zero otherwise. Hermalin and Weisbach (1991) investigated the effect of CEO stock ownership on firm performance, measured as Tobin's q, at various levels of ownership. They found that the effect was positive at levels of ownership less than one percent but became negative at levels greater than one percent. Therefore, CEO stock ownership is classified as "high" in this analysis if the percentage of common stock held by the CEO is at least one percent.

Entrenchment. A CEO is likely to have more influence over the board if he is the founder of the company or has been in the position for a long period of time. Hermalin and Weisbach (1991) found that the profitability of the firm declined after the CEO tenure was fifteen years or more. An entrenched CEO's influence over the board may prevent his or her pay from declining accordingly, thus weakening the pay-performance relationship. A dichotomous variable used to control for CEO entrenchment (ENTRCH) is set equal to one if the CEO is the founder of the company or has been CEO of the company for 15 or more years and zero otherwise.

Firm Size. Freeman (1987) contends that larger firms tend to disclose more information than smaller firms, and that this information is more likely to be followed more closely by analysts and the financial press in response to investor and reader interest. Banz (1981, p. 17) likewise states, "It is likely that the amount of information generated is related to the size of the firm." Because more information is disseminated by them, larger firms may be more closely scrutinized by analysts & investors than smaller firms, resulting in more pressure on boards of larger firms to monitor CEO performance. There is some evidence that this may be the case in that larger firms also tend to have a higher proportion of outside directors on the board [Bacon (1990), Rosenstein and Wyatt (1990)].[24] The additional information dissemination and scrutiny by analysts and the public may result in better monitoring by the boards of larger firms, regardless of their composition. Therefore, in order to isolate the effect of outsider-dominated boards on the pay-performance relation, a control variable is included for firm size. The book value of the firm's total assets is used to proxy for firm size, and

[24]This may imply potential multicollinearity problems between the outside director variable and the large firm variable. No such problems were encountered in the analysis, however. See the discussion of multicollinearity diagnostics in Chapter 5.

firms are categorized as "large" if the firm's total assets are greater than the median total assets of the firms in the sample. The variable used for firm size (LGFIRM) is a dichotomous variable set equal to one if a firm is classified as "large" and zero otherwise.

Dual Leadership. Dual leadership exists when the chairman of the board of directors is also the CEO. According to Bacon (1990), the board chairman is also the CEO in 76% of firms surveyed. Fierman (1990, p. 66) notes that CEOs who also serve as chairman of the board are likely to have some influence over the committee who sets their compensation and the board in general. Rechner (1989) and Crystal (1991a) recommend separating the CEO and board chairmanship positions as a means of improving the effectiveness of corporate governance. To control for dual leadership, a dichotomous variable (CHMN) is set equal to one if the CEO is also chairman of the board and zero otherwise.

Interlocking Directorships. According to the social comparison theory set forth by O'Reilly et al. (1988), directors who are CEOs of other companies use their compensation as a standard of comparison. This may be particularly true in the case of interlocking directorships,

when the CEOs of two firms serve on the board of each other's company. To control for this, a dichotomous variable (LOCK) is set equal to one if an interlocking directorship is present and zero otherwise.

Statistical Analysis

Regression Model

A pooled cross-sectional regression is used in this analysis. The model is expressed as follows:

$$\begin{aligned} CHGPAY = {} & \beta_0 + \beta_1 PERF + \beta_2 OD*PERF + \beta_3 GRWTH + \beta_4 LGSH*PERF + \\ & \beta_5 CEOSTK*PERF + \beta_6 ENTRCH*PERF + \beta_7 LGFIRM*PERF + \\ & \beta_8 CHMN*PERF + \beta_9 LOCK*PERF \end{aligned} \quad (6)$$

where

CHGPAY = $Ln\{(Salary_t+Bonus_t)/(Salary_{t-1}+Bonus_{t-1})\}$

PERF = The performance variable, either %EARN, CHGROE, MRET, or XRET as previously defined

OD = Dichotomous variable equal to 1 if the percentage of independent outside directors is greater than 50%, 0 otherwise

GRWTH = $Ln(\text{net sales}_t / \text{net sales}_{t-1})$

LGSH = Dichotomous variable equal to 1 if the percentage of common shares held by at least one large investor is 5% or higher, 0 otherwise

CEOSTK = Dichotomous variable equal to 1 if the percentage of common stock held by the CEO is at least one percent, 0 otherwise

ENTRCH = Dichotomous variable equal to 1 if the CEO is the founder of the company or has been CEO of the company for 15 or more years, 0 otherwise

LGFIRM = Dichotomous variable equal to 1 if the firm's total assets are larger than the median total assets, 0 otherwise

CHMN = Dichotomous variable equal to 1 if the CEO is also chairman of the board, 0 otherwise

LOCK = Dichotomous variable equal to 1 if an interlocking directorship is present, 0 otherwise

Tests of Hypotheses

Separate regressions are executed using the above model for each of the performance measures; %EARN, CHGROE, MRET, and XRET. To test Hypothesis 1, the regressions are executed on the outsider-dominated subsample only, and the OD*PERF variable is excluded from the model for these regressions. For each regression, a significant positive coefficient (β_1) for the performance variable (PERF) indicates a significant positive relationship between the change in CEO compensation and performance for firms with outsider-dominated boards, supporting Hypothesis 1. To test Hypothesis 2, the regressions are executed on the full sample with the dichotomous variable for outsider-dominated boards included. A significant positive coefficient on the

OD*PERF interaction variable (β_2) for each regression indicates a stronger association between compensation and performance when the board is dominated by independent outside directors, supporting Hypothesis 2.[25]

Because no direct test is available to test Hypothesis 3, the hypothesis is tested indirectly by determining whether each type of performance measure, accounting or stock return, has additional explanatory power when added to a model containing the other type of performance measure. More specifically, the sample is divided into two subsamples, insider-dominated and outsider-dominated firms. For each subsample, each stock return measure is added to the regression model containing an accounting measure of performance and, likewise, each accounting measure is added to the regression model containing a stock return measure of performance.[26] For example, MRET is added to the model

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[25]As discussed in Neter et al. (1990, p. 355-360), using a single regression model with indicator variables rather than fitting separate regressions for insider-dominated and outsider-dominated firms offers two advantages. One advantage is that one regression with an indicator variable yields both fitted regressions. The other advantage is that it is possible to test whether the two regression functions have the same slope, which is the test for Hypothesis 2. See Appendix C for further explanation.

[26]Lambert and Larcker (1987) used a model with both accounting and stock return measures of performance and did not encounter problems of collinearity.

containing %EARN, and then %EARN is added to the model containing MRET. Using the extra sum of squares principle [Myers (1990)], an F-test that compares the sums of squares between the models with and without the added performance measure is applied to each comparison to determine whether the addition of the performance measure adds significant additional explanatory power. This process is repeated for each combination of accounting and stock return measures. Hypothesis 3 is supported if the F-test is significant when one type of performance measure is added for one subsample but not significant when it is added for the other subsample. For example, if adding the stock return measure to the accounting model results in a significant F-statistic for the outsider-dominated subsample but an insignificant F-statistic for the insider-dominated subsample, this would indicate a difference between the two groups in the additional explanatory power of the stock return measure.

Expectations Regarding Control Variables

As discussed in the "Variable Definition" section, a positive association between the change in CEO compensation and growth is expected based on the findings of prior research [e.g., Murphy (1985)]. Thus, the coefficient on growth (β_3) is expected to be positive. The coefficient on

the LGSH*PERF interaction (β_4) is also expected to be positive because the existence of a large block shareholder is expected to make the association between pay and performance stronger.

As previously discussed, CEO compensation may not decline even though profitability has been found to decline when the CEO is entrenched [Hermalin and Weisbach (1991)], resulting in a weaker pay-performance relationship. The coefficient on ENTRCH*PERF (β_6) is thus expected to be negative. Likewise, the coefficients on CHMN*PERF (β_8) and LOCK*PERF (β_9) are expected to be negative because the presence of dual leadership or interlocking directorships may weaken the pay-performance relation. No direction is predicted for the CEOSTK*PERF or LGFIRM*PERF interactions (β_5 and β_7, respectively).

Data

The data used in this analysis consist of four year-changes[27] for each of 200 randomly chosen companies over the period from 1987 through 1991. Data sources include

[27]Observations are referred to as "year-changes" in this analysis because several key variables are defined as the change from one year to the next (e.g. compensation).

Forbes annual surveys of CEO compensation, COMPUSTAT, the Center for Research on Securities Prices (CRSP), and company proxy statements. The sample selection and process of gathering the data are discussed in this section.

Sample Selection

The sample period for this analysis, 1987 through 1991, was chosen to include the most recent data available at the time this project was commenced and a reasonable number of year-changes. This sample period resulted in five years of data and four year-changes for each firm in the sample; 1987-1988, 1988-1989, 1989-1990, and 1990-1991. The five-year period was chosen so that if a particular year-change was not representative of CEO cash compensation changes over time, it would be offset by other year-changes in the sample. The sample period was limited to five years to avoid excessive CEO turnover, based on Puffer and Weintrop's (1991) reported mean CEO tenure of 5.4 years[28] and a mean CEO tenure reported by Pavlik and Belkaoui (1991) of 9.1 years.

A survey of chief executive compensation of

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[28]Puffer and Weintrop (1991) defined CEO tenure as the log of the number of years the CEO held the position. They reported a mean tenure of 1.69, for which the inverse log is 5.4 years.

approximately 800 companies is published annually in May by Forbes. The compensation reported in the survey each year is for the company's most recent fiscal year-end prior to April.[29] While there is considerable overlap of the companies listed in the survey each year, a number of companies are dropped or added to the survey over time. The first (1988) and last (1992) surveys for the sample period were compared to identify companies listed on both surveys, under the assumption that companies appearing in these surveys were also included in the intervening years. This procedure resulted in 588 out of approximately 800 companies for which compensation data were reported by Forbes throughout the sample period.

Because of the nature of the data collection process described below, a random sample was chosen from the 588 companies available. Sample sizes in prior empirical research dealing with board composition range from 80 [Kaplan and Reishus (1990)] to 673 [Mallette and Fowler (1992)] with a median sample size of 138 firms. A sample size of 200 companies was therefore deemed reasonable for this analysis. To select the sample, the 588 available companies were numbered sequentially and a table of random

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[29]For example, CEO compensation for fiscal years ending April, 1991 through March, 1992 are reported in the 1992 survey.

numbers was generated using a Lotus 123 spreadsheet. Because proxy statements were missing for two of the selected companies, Apple Computer and Adolf Coors, two additional companies were randomly selected to replace them. See Appendix A for a listing of sample companies.

Data From Forbes

The compensation survey published by Forbes reports the CEO's name and personal information (age, birthplace, etc.), tenure (years) with the firm and as CEO, compensation, percentage of stock ownership, and company data (sales and profits). The compensation information includes salary and bonus, other compensation, stock gains, and the current year and 5-year total compensation.[30] For this analysis, the relevant data obtained from Forbes include CEO salary and bonus compensation, tenure as CEO and whether the CEO is the founder of the firm, and the percentage of stock owned by the CEO. Because CEO tenure and percentage of stock ownership are disclosed as of a particular date rather than the change from year to year as used for compensation and

[30]"Other" compensation includes payments under long-term compensation plans, thrift plans, health and insurance plans, and restricted stock awards that are vested or released from restrictions. Stock gains consist of the net value in cash realized or shares from exercised stock options or appreciation rights.

performance variables, the measure used for each year-change was the amount reported as of the end of the second year. For example, the CEO tenure and stock ownership used for the 1987-1988 year-change was the amount as of the end of 1988, as reported in the 1989 Forbes survey. This time frame was chosen because the bonus decision for a particular year would be made as of the end of that year or the beginning of the next, and the CEO's tenure or stock ownership at that point may affect the amount of influence the CEO has over the board's decision.

If a change in CEO occurred during the sample period, the firm year-changes surrounding the change in CEO were dropped from the analysis. This was done because CEO-specific factors are likely to affect the level of CEO compensation, so that the change in compensation for a period surrounding a change in CEO may be more reflective of the change in CEO than firm performance. For those firms for which a change in CEO occurred, the proxy statement was used to try to ascertain the exact date of the change. If the change occurred during the year, the salary and bonus compensation for the year of change would include partial year compensation for both the old and new CEO, and the compensation from the preceding year to the year of change, as well as the year of change to the succeeding year, would not be comparable. Thus, the year of change in CEO as well

as one year preceding and one year following the year of change were excluded from the sample, resulting in the exclusion of up to two year-changes.[31] If the change in CEO occurred at the firm's fiscal year end, the year of change in CEO and year following were excluded from the sample, resulting in the exclusion of one year-change. In many cases when CEO turnover occurred, the Forbes survey listed the new CEO and not the outgoing CEO. When CEO turnover occurred at the end of the fiscal year, proxies were used to obtain the missing information regarding CEO salary and bonus compensation and CEO stockholdings for the outgoing CEO. Also, the CEO salary and bonus compensation and CEO stockholdings data from the Forbes surveys were compared to the proxy statements on a test basis with no material differences noted.

Data From COMPUSTAT and CRSP

For the performance measures, data used in calculating the financial variables were gathered from COMPUSTAT files, and stock return data were obtained from the Center for Research on Securities Prices (CRSP) tapes.

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[31]For example, if a change in CEO occurred during 1989, year-changes 1988-1989 and 1989-1990 were excluded from the sample.

COMPUSTAT. To gather data from COMPUSTAT, the CUSIP and PERM numbers were identified for each of the selected firms. All but two of the firms were identified on the COMPUSTAT Annual Primary Secondary Tertiary (APST) tape, with the two remaining firms identified on the Research PST tape. The financial data obtained from the COMPUSTAT tapes included sales (item 12), income before extraordinary items and discontinued operations (item 18), common equity (item 60), and total assets (item 6). The financial data were obtained for fiscal years 1987 through 1991. Each firm's ticker symbol, SIC code and fiscal year-end were also obtained from COMPUSTAT.

In a given year (t), COMPUSTAT includes the annual financial data for firms with fiscal years ending in June of year t through May of the following year (t+1).[32] The financial data obtained from COMPUSTAT thus included fiscal years ending from June, 1987 through May, 1992 in the sample period. The cutoff used in the Forbes survey, however, was April of year t through March of year t+1. The data obtained from the Forbes survey thus included fiscal years ending from April, 1987 through March, 1992 in the sample period. As a result, data for firms with fiscal years

[32]For example, the annual data for firms with fiscal years ending June 1991 through May 1992 were all included on COMPUSTAT in fiscal year 1991, which was Year 20 on the tape used for this analysis.

ending in April or May did not coincide between COMPUSTAT and the Forbes surveys as shown below:

Fiscal Year	Forbes Survey	COMPUSTAT
1987	April, 1987 - March, 1988	June, 1987 - May, 1988
1988	April, 1988 - March, 1989	June, 1988 - May, 1989
1989	April, 1989 - March, 1990	June, 1989 - May, 1990
1990	April, 1990 - March, 1991	June, 1990 - May, 1991
1991	April, 1991 - March, 1992	June, 1991 - May, 1992

For those firms with fiscal years ending in April and May, COMPUSTAT financial data for years ending April and May, 1992 were deleted, and financial data for years ending April and May, 1987 were manually collected from the firms' annual reports on WestLaw. COMPUSTAT financial data for years ending April and May, 1988, 1989, 1990, and 1991 were coded to correspond with the Forbes survey data[33].

The COMPUSTAT financial data were then used to calculate the variables specified in the statistical model, %EARN, CHGROE, and GRWTH, as defined in equations (2), (3), and (5) in the "Variable Definition" section of this chapter. As a result of these computations, the data were reduced from five years of data per firm to four year-changes per firm.

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[33]That is, April and May, 1988, were coded as fiscal year 1988, April and May, 1989, were coded as fiscal year 1989, etc.

Because total assets (used to determine the dichotomous firm size variable, LGFIRM) are measured as of a particular date rather than the change from year to year as used for other financial variables, the measure assigned to each year-change was the value of total assets reported as of the end of the second year.[34] In this way, the LGFIRM determination corresponds to the timing of compensation decisions, which are made as of the end of the year.[35] The dichotomous variable, LGFIRM, was then set equal to one if total assets for a given year-change were greater than the median total assets of all year-changes in the sample, and zero otherwise.

CRSP. Data used to calculate annual market-adjusted and excess returns were obtained from the Center for Research on Securities Prices (CRSP) tapes. Daily returns for firms listed on the New York and American Stock Exchanges are provided on the NYSEAMEX tape, and the NASDAQ tape provides returns for firms listed on the NASDAQ

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[34]That is, the value of total assets at fiscal year-end 1988 was assigned to the 1987-1988 year-change, fiscal year-end 1989 total assets were assigned to the 1988-1989 year-change, and so on.

[35]For example, the compensation for 1988 would be determined by the board as of the end of 1988, which would in turn determine the amount of change in compensation for the 1987-1988 year-change.

exchange. Sample firms were first identified by PERM number on the NYSEAMEX or NASDAQ tape, and the dates for which returns were reported for each firm were noted to ensure that the entire sample period was included. For firms that changed from NASDAQ to NYSEAMEX during the sample period, the date of the change was noted.

The dates for which firms' daily stock returns are reported by CRSP are sequentially numbered beginning with day 1, the date when daily returns were first reported. The fiscal year-end for each firm, as determined from COMPUSTAT and the Forbes surveys, was used to determine the beginning and ending dates for each fiscal year in the sample period. The number of the first CRSP day corresponding to the beginning date of the fiscal year and number of the last CRSP day corresponding to the fiscal year-end date were then identified. Because CRSP days represent trading days on the exchanges and trades are not made every day of the year, there may not be a CRSP day corresponding to the beginning or ending date of the fiscal year. In these cases, the number of the first CRSP day following the beginning date of the fiscal year and number of the last CRSP day prior to the fiscal year-end date were identified. For firms that changed from NASDAQ to NYSEAMEX, the CRSP day for which a return was last reported on NASDAQ and the CRSP day for which a return was first reported on NYSEAMEX were also

identified.

The PERM numbers and CRSP days were then used to obtain the daily returns for each firm and fiscal year in the sample period from the NYSEAMEX and NASDAQ tapes. The CRSP days were also used to obtain the daily value-weighted market returns for each fiscal year in the sample period from the NYSEAMEX and NASDAQ tapes. The annual returns for each firm and for the market for each fiscal year in the sample period were calculated by compounding the daily company and market returns. Compounding involves computing one plus the daily return for each reported day of the fiscal year, multiplying them together, and subtracting one.[36] For firms that changed from NASDAQ to NYSEAMEX, the annual return for the year of the change was calculated by first computing the partial year return for each stock exchange using compounding and then multiplying one plus the NASDAQ return by one plus the NYSEAMEX return and subtracting one.

Excess returns are calculated by CRSP as the firm's return less the return for a portfolio of firms of similar beta, and are available for NYSEAMEX firms only. Daily

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[36]Compounding may be expressed mathematically as follows. Let R_a represent the annual return and R_d the daily return where d = days in the fiscal year = 1,2,...,d. Then,

$$R_a = [(1+R_1)(1+R_2) \ldots (1+R_d)] - 1$$

excess returns were obtained from the CRSP tape for each firm and fiscal year using the PERM numbers and CRSP days. Annual excess returns were then calculated by compounding the daily excess returns, as previously described. For firms that changed from NASDAQ to NYSEAMEX, excess returns were calculated for full fiscal years only, and the year of change was dropped.

Although the annual returns were calculated for fiscal years (e.g., 1988), they actually represent the change in the value of the stock from the end of the preceding fiscal year to the end of the given fiscal year (e.g., 1987-1988). Year-changes were thus assigned to the returns accordingly.[37] The files for NYSEAMEX company and market returns, NASDAQ company and market returns, and excess returns were then merged by firm and year-change.

Data From Proxy Statements

Data on director affiliations, percentage of stock ownership by large outside investors, dual leadership, and interlocking directorships were assembled from firms' proxy statements.

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[37]That is, returns for fiscal 1988 were assigned year-change 1987-1988, fiscal 1989 returns were assigned year-change 1988-1989, and so on.

Reason for Using Proxies. Proxy statements provide information to stockholders of the company as well as proposals subject to vote by the stockholders at the company's annual meeting. While other sources of director information, such as Moody's Industrial Manual or Dun and Bradstreet's "Reference Book of Corporate Managements," have been used in other studies [e.g., Schellenger et al. (1989), Fosberg (1989)] and may be more readily accessible, they provide only the names and current employers of the directors. Proxy statements provide additional information on the directors, including the employment history of each director for at least the preceding five years, whether the director's employer is a subsidiary of the company, and any familial relationships between directors or between a director and an employee of the company. Other affiliations may be disclosed in the employment history, such as whether a director was formerly an employee of the company or its subsidiary. Proxy statements also provide information regarding cash compensation paid to the five highest-paid executives; stock ownership by officers, directors, and any parties with holdings of five percent or more; and related-party transactions. From the related-party information, it could be ascertained whether a director provided services to the company or whether there were transactions between a director's firm and the company. Thus, by using proxies,

more information was obtained regarding affiliations between directors and the company, resulting in a more refined classification of the directors into inside, affiliated, or independent outside directors, as previously defined. The proxies also provided the information needed for several of the control variables used in the analysis. Using proxies, therefore, resulted in a more refined sample than has been used in some of the previous studies.

Sources of Proxies. Relevant portions of proxy statements were obtained through the LEXIS and WestLaw data services. The relevant portions included sections on stock ownership, executive cash compensation, information on directors nominated for election as well as continuing directors, and related-party transactions. If a proxy was unavailable for a particular firm for a given year, the data for that year could usually be estimated from the proxies for the surrounding years because the director affiliations and control variable attributes did not quickly change.

Timing of Variables. Because director affiliation and other control variable attributes are determined as of a point in time, rather than over a period of time as used for compensation and performance variables, the appropriate timing and matching with year-changes had to be determined.

This matching of the date of the proxy with each year-change for each attribute variable obtained from the proxies is summarized in Table 2.

For director affiliations and interlocking directorships, the data from the proxy dated the second year of the year-change was matched to the year-change. This timing was chosen because the proxy for that year gives information on continuing directors and those nominated for election at the annual shareholders' meeting for that year. By so doing, it was assumed that the nominated directors would be elected.[38] It is these directors who would most likely constitute the board that would evaluate the performance and make the compensation decisions at the end of that fiscal year or beginning of the next, prior to the stockholders' meeting in which election of directors would be held again. For example, the 1988 proxy provides information on continuing directors and nominees who, if elected, would constitute the board for the 1988 fiscal year. The board would then likely evaluate the performance and make the compensation decisions for the 1988 fiscal year at the end of fiscal 1988 or beginning of fiscal 1989, prior to the next shareholders' meeting. The compensation

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[38]It was very rare that nominated directors were not elected by shareholders, and was easily verified from the proxy for the following year.

Table 2

Proxy date used for variables by year-change

	Year-change			
Variable	87-88	88-89	89-90	90-91
Director affiliation	1988	1989	1990	1991
Large shareholder	1989	1990	1991	1992
Dual leadership	1989	1990	1991	1992
Interlocking directorships	1988	1989	1990	1991

decisions made at that time would in turn determine the change in compensation for the 1987-1988 year-change.

For the large shareholder and dual leadership variables, the data from the proxy dated the year following the year-change was matched to the year-change. This timing was chosen because compensation decisions for a given year would be made at the end of that year or early in the following year, so the decision would most likely be affected by the presence of a large shareholder or dual leadership at that time. For example, the compensation decision for fiscal 1988 would likely be made at the end of fiscal 1988 or beginning of fiscal 1989, which may be influenced by the presence of a large shareholder or dual leadership at that time, as identified in the 1989 proxy.

Data Assembly

The data from the Forbes surveys and firm proxy statements were manually gathered and assembled using electronic spreadsheets. The spreadsheets were transformed into two data sets, compensation data and director data, and uploaded onto the mainframe computer. This resulted in a total of four separate data files on the mainframe: (1) compensation data, which included the change in salary and bonus compensation; (2) director data, which included the

number of outside directors, the total number of directors, the percentage of CEO stockholdings, and whether a large shareholder, entrenchment, dual leadership, and interlocking directorships were present; (3) financial data, which included percentage change in earnings, change in earnings weighted by common equity, growth, and total assets; and (4) returns data, which included company returns, market returns, and excess returns. The four data files were then merged by firm CUSIP number and year-change into one data set using SAS.

Once a single data set was assembled, market-adjusted returns (MRET) were calculated as specified in equation (4), and the OD, LGFIRM, and CEOSTK dichotomous variables were coded as described in the "Variable Definition" section. To code the OD variable, the percentage of outside directors (%OD) was first calculated by dividing the number of outside directors (NOD) by the total number of directors (TOTDIR):

$$\%OD = NOD/TOTDIR \qquad (7)$$

The outside director variable (OD) was then coded as one if the percentage of outside directors was greater than 50% and zero if it was 50% or less. The median of the total assets was calculated, and the LGFIRM variable was coded as one if the firm's total assets were greater than the median, and zero otherwise. Finally, the CEOSTK variable was coded as one if the percentage of CEO stock ownership was greater

than or equal to one percent and zero otherwise.

The data were then analyzed using the statistical model, equation (6), described in the "Statistical Analysis" section of this chapter. The results of the analyses are discussed in the next chapter.

CHAPTER 5

ANALYSIS OF RESULTS

This chapter consists of a description of the data and sample size, diagnostic tests on initial regressions of the data, and the results of the tests of hypotheses using the model described in the "Statistical Analysis" section of Chapter 4.

Data Description

Sample Size

As described in the "Data" section of Chapter 4, the sample consists of four year-change observations for 200 randomly selected companies for a potential total sample size of 800 observations. The sample size was reduced, however, due to the exclusion of observations for several

reasons. The primary reason for excluding observations was the change in CEO for some firms during the sample period. As discussed in the "Data from Forbes" section of Chapter 4, if a change in CEO occurred, the year of the change in CEO as well as the year preceding and year following the change were excluded from the analysis, resulting in the exclusion of up to 2 year-changes. If the change in CEO occurred at the firm's fiscal year-end, only the year of change and year following were excluded, resulting in the loss of one year-change. The sample size was reduced by 122 observations due to a change in CEO.

Additional observations were lost due to missing proxies or a significant change in the sample firm. Because the 1987 and 1988 proxies were unavailable for Sun Microsystems, it was not possible to ascertain the board affiliations for the 1987-1988 year-change. This resulted in the loss of one observation. Two more observations were lost because Bear Stearns changed their fiscal year-end in 1988 from April to June. Because the 1989 fiscal year was then a 14-month period ending June 30, 1989, fiscal 1989 was not comparable with fiscal 1988 and fiscal 1990. The 1988-1989 and 1989-1990 year-changes for Bear Stearns were thus excluded from the sample. Finally, Hasbro Inc. acquired Tonka in May, 1991. Because this caused a significant change in the company, the 1990-1991 year-change was

excluded from the sample.

The exclusion of these observations reduced the sample size from the potential 800 observations to a total of 674 observations. This reduction in sample size is summarized in Table 3.

Descriptive Statistics

Descriptive statistics were calculated using the SAS Univariate procedure on all variables previously defined in the "Variable Definition" section of Chapter 4 for the total sample of 674 observations and for subsamples of outsider-dominated firm-years (OD coded "1") and insider-dominated firm-years (OD coded "0").[39] Sample sizes for the outsider-dominated and insider-dominated subsamples were 459 and 215 observations, respectively.[40] These statistics are presented on continuous variables in Table 4 and on dichotomous variables in Table 5. Statistics on the

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[39]As defined in the "Variable Definition" section of Chapter 4, an outsider-dominated board is composed of more than 50% independent outside directors, and an insider-dominated board is composed of 50% or less independent outside directors.

[40]As noted in the "Data" section of Chapter 4, excess returns are available for NYSEAMEX firms only. As a result, the sample sizes were reduced for the XRET variable to 568 observations for the total sample, 373 for the outsider-dominated subsample, and 195 for the insider-dominated subsample.

Table 3

Sample Size

Total observations (200 firms x 4 year-changes)	800
Observations excluded due to:	
Change in CEO	- 122
Missing Sun Microsystems proxies	- 1
Bear Stearns change in fiscal year-end	- 2
Hasbro acquisition of Tonka	- 1
Total observations	674

covariates used in Equation (6), the statistical model described in the "Statistical Analysis" section of Chapter 4, are displayed in Table 6 for each of the performance variables for the total sample only. In addition, a comparison is made in Table 7 of the number of outside directors and board sizes for the two subsamples as well as the distribution of outsider representation.

Continuous Variables. Table 4 shows the mean, standard deviation, median, and upper and lower quartiles for all continuous variables used in the analyses. These continuous variables include the change in salary and bonus compensation (CHGPAY), percentage change in earnings (%EARN), change in earnings weighted by common equity (CHGROE), market-adjusted returns (MRET), excess returns (XRET), and growth (GRWTH). The variables in Table 4 also include the proportion of independent outside directors, the percentage of CEO stockholdings, and the total assets. These variables were used to determine the dichotomous variables OD, CEOSTK, and LGFIRM, respectively.

In the discussion on the percentage change in earnings in the "Variable Definition" section of Chapter 4, it was noted that the percentage change in earnings (%EARN) may

Table 4

Descriptive statistics for continuous variables for outsider-dominated and insider-dominated subsamples and the total sample.[a]

Variable / Subsample	Mean	Standard Deviation	Median	Upper Quartile	Lower Quartile
CHGPAY[b]					
Outsider	0.0705	0.1952	0.0766	0.1484	0.0000
Insider	0.0839	0.2559	0.0868	0.1730	0.0064
Total	0.0748	0.2163	0.0800	0.1584	0.0031
%EARN[b]					
Outsider	0.1709	5.5059	0.0713	0.2200	-0.1292
Insider	-1.6832	27.4247	0.1206	0.2526	-0.1379
Total	-0.4206	16.1411	0.0905	0.2352	-0.1292
CHGROE[b]					
Outsider	-0.0031	0.1526	0.0105	0.0305	-0.0228
Insider	0.0010	0.1159	0.0177	0.0416	-0.0200
Total	0.0011	0.1420	0.0140	0.0346	-0.0204
MRET[b]					
Outsider	-0.0025	0.2851	-0.0101	0.1265	-0.1638
Insider	0.0159	0.3086	-0.0204	0.1434	-0.1536
Total	0.0034	0.2927	-0.0130	0.1329	-0.1618
XRET[b,c]					
Outsider	-0.0666	0.2415	-0.0531	0.1033	-0.2077
Insider	-0.0325	0.2613	-0.0432	0.1289	-0.1970
Total	-0.0549	0.2488	-0.0513	0.1084	-0.2052
Proportion of outside directors					
Outsider	0.6813	0.0962	0.6667	0.7391	0.6000
Insider	0.3570	0.1247	0.4000	0.4545	0.2727
Total	0.5779	0.1847	0.6133	0.7059	0.4615
GRWTH[b]					
Outsider	0.0734	0.1125	0.0646	0.1230	0.0132
Insider	0.1067	0.1931	0.0793	0.1549	0.0240
Total	0.0841	0.1439	0.0691	0.1336	0.0178
% CEO stockholdings					
Outsider	1.1084	3.3464	0.1200	0.3600	0.0400
Insider	3.0849	6.2241	0.3600	2.8100	0.0700
Total	1.7389	4.5595	0.1700	0.5700	0.0500
Total Assets[d]					
Outsider	10,351.6	16,687.1	5,257.7	11,030.1	2,783.9
Insider	10,605.5	21,491.8	3,123.0	10,148.1	1,514.0
Total	10,432.6	18,340.9	4,710.6	10,651.7	2,013.5

[a]Sample sizes: Total, 674; outsider-dominated, 459; insider-dominated, 215.

[b]Variables defined in "Variable Definition" section, Chapter 4.

[c]Because excess returns are available only for NYSEAMEX firms, the sample sizes for XRET were reduced as follows: total, 568; outsider-dominated, 373; insider-dominated, 195.

[d]In millions of dollars.

become large when prior year earnings are near zero.[41] In Table 4, the large standard deviations and large differences between the means and medians for %EARN, particularly for the insider-dominated subsample, would seem to indicate that this problem has occurred. Sloan (1993) rectified a similar problem by deleting the most extreme one percent tails of the distribution. The top one percent tail for %EARN was 13.4966 and the bottom one percent tail was -4.2775; thus, it appears that a certain amount of skewness would remain after deleting the most extreme one percent tails in this case. As an alternative, observations for which %EARN was greater than 5.0 (500%) or less than -5.0 (-500%) were deleted. This resulted in the loss of 20 observations for the total sample, reducing the sample size to 654 observations for the analyses in which %EARN was included. Sample sizes for the outsider-dominated and insider-dominated subsamples were also reduced proportionately. The outsider-dominated subsample was reduced by 14 observations to 445, and the insider-dominated subsample was reduced by 6 observations to 209. The exclusion of these observations improved the descriptive statistics for the %EARN variable, as shown below:

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[41]See Equation (2) in the "Percentage Change in Earnings" section of Chapter 4.

	Mean	Standard Deviation	Median	Upper Quartile	Lower Quartile
%EARN					
Outsider	0.0139	0.9097	0.0673	0.2105	-0.1333
Insider	0.0611	0.7467	0.1201	0.2453	-0.1275
Total	0.0290	0.8607	0.0779	0.2231	-0.1333

Interestingly, the means and standard deviations changed significantly, but the medians and interquartile ranges remained very similar to the previous results. The descriptive statistics for the other continuous variables also remained very similar to the previous results and are, therefore, not repeated.

In comparing the outsider-dominated and insider-dominated subsamples in Table 4, it appears that the insider-dominated firm-years tended to have a slightly larger increase in pay, although the difference in the means of the CHGPAY variable was not statistically significant (t = 0.7484, p-value = 0.4545). The performance measures, including %EARN, CHGROE, MRET, and XRET, also appear correspondingly slightly larger for the insider-dominated subsample, although again the differences in the means were not statistically significant, as shown below:

	%EARN	CHGROE	MRET	XRET
t-statistic	0.6534	1.1153	0.7595	1.5537
p-value	0.5137	0.2651	0.4478	0.1208

The insider-dominated firm-years appear to be growing at a greater rate than the outsider-dominated firm-years, as indicated by the GRWTH variable. The difference in the

means for GRWTH was statistically significant (t = 2.8096, p-value = .0051). The mean percentage of CEO stockholdings was also significantly larger for the insider-dominated subsample than for the outsider-dominated subsample (t = 5.3520, p-value < 0.0001).

Although the total assets for the insider-dominated firm-years appears to be slightly larger on average than the outsider-dominated firm-years, the difference in the means was not statistically significant (t = 0.1674, p-value = 0.8671). There was also more variability in the insider-dominated subsample, as indicated by the standard deviations, and the median and upper and lower quartiles appear to indicate that the outsider-dominated firm-years may be slightly larger overall.

Dichotomous Variables. The descriptive statistics on the dichotomous variables are shown in Table 5. As defined in the "Variable Definition" section of Chapter 4, the dichotomous variables include the CEO stock ownership (CEOSTK), large firm (LGFIRM), large block shareholder (LGSH), CEO entrenchment (ENTRCH), dual leadership (CHMN), and interlocking directorships (LOCK). Table 5 shows the number of observations coded "1" versus "0" for each of these variables for the outsider-dominated and insider-dominated subsamples and the total sample. CEOSTK was coded

Table 5

Descriptive statistics on dichotomous variables for outsider-dominated and insider-dominated subsamples and total sample.

Variable	Outsider-dominated	Insider-dominated	Total sample
Number of observations	459	215	674
CEOSTK			
Coded "1"	55	87	142
Coded "0"	404	128	532
Fraction coded "1"	0.1198	0.4047	0.2107
z-statistic[a]			-8.45
p-value			< 0.0001
LGFIRM			
Coded "1"	261	76	337
Coded "0"	198	139	337
Fraction coded "1"	0.5686	0.3535	0.5000
z-statistic[a]			5.21
p-value			< 0.0001
LGSH			
Coded "1"	219	104	323
Coded "0"	240	111	351
Fraction coded "1"	0.4771	0.4837	0.4792
z-statistic[a]			-0.16
p-value			0.4364
ENTRCH			
Coded "1"	91	75	166
Coded "0"	368	140	508
Fraction coded "1"	0.1983	0.3488	0.2463
z-statistic[a]			-4.23
p-value			< 0.0001
CHMN			
Coded "1"	447	202	649
Coded "0"	12	13	25
Fraction coded "1"	0.9739	0.9395	0.9629
z-statistic[a]			2.20
p-value			0.0139
LOCK			
Coded "1"	125	41	166
Coded "0"	334	174	508
Fraction coded "1"	0.2723	0.1907	0.2463
z-statistic[a]			2.29
p-value			0.0110

[a]The z-statistic provides the test for equality of the proportion coded "1" between the outsider and insider-dominated subsamples.

"1" if the percentage of CEO stockholdings was at least one percent. LGFIRM was coded "1" if the total assets for the firm-year exceeded the median total assets for all firm-years in the sample. As a result, the number of observations in the total sample was evenly divided between "1" and "0". LGSH was coded "1" if 5% or more of common shares were held by at least one investor not in management. ENTRCH was coded "1" if the CEO was founder of the company or had been the CEO for 15 or more years. CHMN was coded "1" if the CEO was also the chairman of the board. Finally, LOCK was coded "1" if an interlocking directorship was present.

In comparing the outsider-dominated and insider-dominated subsamples, it is evident that the insider-dominated subsample had a significantly larger proportion of CEO stockholdings of at least than one percent (CEOSTK). This corresponds with the statistics in Table 4, which showed a significantly larger mean percentage of CEO stockholdings for the insider-dominated subsample. The outsider-dominated subsample consisted of a significantly larger proportion of "large" firms with total assets greater than the median total assets for the total sample (LGFIRM). This appears to confirm that the outsider-dominated subsample consisted of larger firms, as indicated by the median and upper and lower quartiles in Table 4. The

insider-dominated subsample also appears to have a significantly larger proportion of entrenched CEOs (ENTRCH), while the proportion of interlocking directorships (LOCK) was significantly larger for the outsider-dominated subsample. The proportion of large shareholders (LGSH) appears to be similar between the two subsamples.

The variable for dual leadership (CHMN), in which the CEO is also chairman of the board, indicates that there were very few instances in which the CEO was not also chairman of the board for both the outsider-dominated and insider-dominated subsamples. In only 25 out of the total 674 observations, less than four percent, was the chairman not also the CEO. As a result, the CHMN variable was dropped from future analyses.

Covariate Variables. In the statistical model, Equation (6) in the "Statistical Analysis" section of Chapter 4, the dichotomous control variables were combined with each performance variable to form covariates. The model was repeated for each of the performance variables, %EARN, CHGROE, MRET, and XRET. The mean, standard deviation, median, and upper and lower quartiles for the performance variables and covariates are displayed in Table 6 for each of the performance variable models. It should be noted that the descriptive statistics for each of the

Table 6

Descriptive statistics on covariate variables

	PERF = %EARN[a]	PERF = CHGROE[b]	PERF = MRET[b]	PERF = XRET[c]
PERF - Mean	0.0290	0.0011	0.0034	-0.0549
Std. Deviation	0.8607	0.1420	0.2927	0.2488
Median	0.0779	0.0140	-0.0130	-0.0513
Upper Quartile	0.2231	0.0346	0.1329	0.1084
Lower Quartile	-0.1333	-0.0204	-0.1618	-0.2052
OD*PERF - Mean	0.0095	-0.0021	-0.0017	-0.0437
Std. Deviation	0.7501	0.1259	0.2352	0.1982
Median	0.0000	0.0000	0.0000	0.0000
Upper Quartile	0.1367	0.0213	0.0551	0.0199
Lower Quartile	0.0000	0.0000	-0.0842	-0.1266
GRWTH - Mean	0.0851	0.0841	0.0841	0.0765
Std. Deviation	0.1447	0.1439	0.1439	0.1409
Median	0.0704	0.0691	0.0691	0.0641
Upper Quartile	0.1336	0.1336	0.1336	0.1218
Lower Quartile	0.0181	0.0178	0.0178	0.0161
LGSH*PERF - Mean	0.0238	0.0000	0.0047	-0.0279
Std. Deviation	0.7627	0.1280	0.2273	0.1850
Median	0.0000	0.0000	0.0000	0.0000
Upper Quartile	0.0692	0.0140	0.0000	0.0000
Lower Quartile	0.0000	0.0000	-0.0048	-0.0359
CEOSTK*PERF -Mean	0.0176	0.0024	0.0115	0.0000
Std. Deviation	0.3218	0.0371	0.1554	0.0984
Median	0.0000	0.0000	0.0000	0.0000
Upper Quartile	0.0000	0.0000	0.0000	0.0000
Lower Quartile	0.0000	0.0000	0.0000	0.0000
ENTRCH*PERF - Mean	0.0077	0.0001	0.0062	-0.0069
Std. Deviation	0.3864	0.0998	0.1568	0.1133
Median	0.0000	0.0000	0.0000	0.0000
Upper Quartile	0.0000	0.0000	0.0000	0.0000
Lower Quartile	0.0000	0.0000	0.0000	0.0000
LGFIRM*PERF - Mean	-0.0056	-0.0008	0.0038	-0.0319
Std. Deviation	0.6486	0.0779	0.2202	0.1809
Median	0.0000	0.0000	0.0000	0.0000
Upper Quartile	0.0703	0.0116	0.0000	0.0000
Lower Quartile	0.0000	0.0000	-0.0139	-0.0487
LOCK*PERF - Mean	-0.1361	-0.0004	0.0025	-0.0081
Std. Deviation	0.2822	0.0420	0.1313	0.1119
Median	0.0000	0.0000	0.0000	0.0000
Upper Quartile	0.0000	0.0000	0.0000	0.0000
Lower Quartile	0.0000	0.0000	0.0000	0.0000

[a]Sample size = 654 observations
[b]Sample size = 674 observations
[c]Sample size = 568 observations

performance variables are the same as those in Table 4, with the exception of the %EARN variable. The statistics for the %EARN variable correspond to those determined after the observations for which %EARN was greater than 5.0 or less than -5.0 were dropped from the analysis.

Because many of the covariates were formed using dichotomous variables, the median as well as the upper and/or lower quartiles are zero in many cases.

Board Size and Outside Directors. The number of independent outside directors, the total number of directors on the board, and the mean and median proportion of independent outside directors are shown in Panel A of Table 7. The mean and median proportion of independent outside directors is repeated from Table 4. Panel B of Table 7 shows the distribution of outsider representation on the boards by deciles of the proportion of outside directors.

In Panel A, the outsider-dominated boards have, by definition, a greater number and proportion of independent outside directors. The total number of directors also tended to be larger for the outsider-dominated boards than for the insider-dominated boards. The difference in the mean board size was statistically significant ($t = 4.8959$, p-value < 0.0001).

In Panel B, the distribution of outsider representation

Table 7

Number of outside directors, board size, and frequency of outside director representation.

Panel A: Number of outside directors, board size, and proportion of outside directors.

Variable	Outsider-dominated	Insider-dominated	Total Sample
Number of outside directors - Mean	9.5	4.5	7.9
- Median	9.0	5.0	8.0
Board size - Mean	13.9	12.2	13.4
- Median	13.0	12.0	13.0
Proportion of outside directors - Mean	0.6813	0.3570	0.5779
- Median	0.6667	0.4000	0.6133

Panel B: Frequency of outsider representation on boards.

Proportion of outside directors	Number of observations
0% - 10%	6
> 10% - 20%	25
> 20% - 30%	38
> 30% - 40%	48
> 40% - 50%	98
Total with 50% or less outsiders	215
> 50% - 60%	119
> 60% - 70%	170
> 70% - 80%	122
> 80% - 90%	38
> 90% - 100%	10
Total with > 50% outsiders	459
Total observations	674

appears to be grouped around 60%, which corresponds with the mean and median proportion of outside directors for the total sample in Panel A, with few observations in the tails of the distribution. The largest concentration of observations, 170, falls in the > 60% - 70% range. Of the 98 observations in the > 40% - 50% range, 35 had exactly 50% outside directors.

Diagnostics

Prior to testing the hypotheses, initial regressions were executed and diagnostic tests were performed to identify any problems with multicollinearity, high influence observations,[42] and heteroscedasticity. These initial regressions and diagnostic tests are described in this section.

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[42]High influence observations may sometimes be referred to as "outliers." Myers (1990) reserves the term "outlier" to refer to an observation that may represent a model fallacy, whereas "high influence" is a more general term that refers to an observation that may exert an undue amount of influence on the regression results. In keeping with the terminology used in Myers (1990), "high influence" is used in this analysis.

Multicollinearity

Initial regressions were executed separately for each of the performance variables, using the SAS PROC REG procedure and the model specified in Equation (6) in Chapter 4 with the exclusion of the CHMN variable. Collinearity diagnostics were produced for each performance variable model using the VIF and COLLINOINT options, which generated the variance inflation factors (VIFs) and variance proportions for each variable as well as the eigenvalues and condition indices.

While it is sometimes helpful to analyze the simple correlations between variables, Myers (1990) points out that these are one-on-one associations between the regressor variables and may not provide adequate information regarding the associations among multiple regressor variables. Myers (1990) therefore recommends the use of the variance inflation factors, together with analysis of the variance proportions for "near zero" eigenvalues, to identify multicollinearity problems. As a result of this recommendation, the correlation matrices are presented in Appendix B, Tables B1 through B4, for the curious reader but were not used in determining the extent of multicollinearity in these analyses.

The collinearity diagnostics are displayed in Table 8

Table 8

Collinearity diagnostics: Variance inflation factors, variance proportions, eigenvalues, and condition indices

	PERF = %EARN[a]		PERF = CHGROE[b]		PERF = MRET[b]		PERF = XRET[c]	
Variable	VIF	Var Prop[d]	VIF	Var Prop[d]	VIF	Var Prop[d]	VIF	Var Prop[d]
PERF	12.829	0.9885	14.403	0.9686	8.832	0.9850	6.727	0.9852
OD*PERF	4.971	0.3453	5.817	0.2370	3.417	0.3219	3.063	0.3375
GRWTH	1.104	0.0727	1.071	0.0420	1.038	0.0228	1.026	0.0042
LGSH* PERF	5.633	0.5095	7.939	0.6645	2.983	0.3463	2.349	0.3415
CEOSTK* PERF	1.608	0.0063	1.543	0.0833	3.309	0.1160	2.130	0.0468
ENTRCH* PERF	1.827	0.0429	3.024	0.0001	3.406	0.0100	2.241	0.0348
LGFIRM* PERF	2.543	0.1423	2.167	0.0885	2.832	0.1595	2.254	0.1909
LOCK* PERF	1.521	0.0149	1.510	0.0645	1.592	0.0491	1.364	0.0543
	Eigen-values	Cond. Index	Eigen-values	Cond. Index	Eigen-values	Cond. Index	Eigen-values	Cond. Index
	3.8958	1.0000	3.7834	1.0000	3.9004	1.0000	3.5389	1.0000
	1.3137	1.7221	1.3490	1.6747	1.5178	1.6031	1.4182	1.5797
	0.9806	1.9932	1.0012	1.9440	0.9703	2.0049	0.9896	1.8911
	0.7814	2.2328	0.9080	2.0412	0.7251	2.3193	0.8598	2.0288
	0.4718	2.8736	0.5533	2.6150	0.3228	3.4760	0.4900	2.6874
	0.3252	3.4610	0.2083	4.2617	0.3115	3.5386	0.3273	3.2883
	0.1754	4.7134	0.1494	5.0319	0.1675	4.8258	0.2669	3.6417
	0.0561	8.3323	0.0475	8.9277	0.0847	6.7855	0.1093	5.6904

[a]Sample size = 654 observations
[b]Sample size = 674 observations
[c]Sample size = 568 observations
[d]Variance proportions are given for the smallest eigenvalue (largest condition index) only.

for each performance variable model. Included in Table 8 are the variance inflation factors (VIFs) for each variable, the eigenvalues and condition indices for each model, and the variance proportions for the smallest eigenvalue (largest condition index) only.[43]

As a rule of thumb, Myers (1990, p. 369) recommends that if any variance inflation factor exceeds ten, there is some concern that linear dependencies exist, and variable deletion or an alternative to least squares estimation should be considered. From Table 8, the %EARN and CHGROE models each have one variance inflation factor that exceeds ten whereas the MRET and XRET models do not have any variance inflation factors that exceed ten. The largest VIFs in both the %EARN and CHGROE models are on the performance variables, indicating that the coefficients on the performance variables are adversely affected by the linear dependencies. The largest condition indices[44] for the %EARN and CHGROE models are far less than the recommended rule of thumb of approximately 30 [Myers

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[43]The variance proportions for the remaining eigenvalues are not displayed because the eigenvalues were not considered "near zero" and, therefore, the variance proportions were not used.

[44]The condition index is a function of the eigenvalues so that the smaller the eigenvalue, the larger the condition index. "Near zero" eigenvalues will, therefore, have very large condition indices.

(1990)],[45] and are not therefore indicative of serious instability in the regression coefficients. Although the multicollinearity problem does not appear to be severe, it is further investigated because the coefficients on the performance variables appear to be the most adversely affected and they are of extreme importance to the hypothesis testing.

The variance proportions measure the proportion of the variance of each coefficient attributable to each dependency, and are then used to identify those regressor variables involved in the linear dependencies. As Myers (1990, p. 372) states:

> 'A small eigenvalue (serious linear dependency), accompanied by a subset of regressors (at least two) with high variance proportions, represents a dependency involving the regressors in that subset, and the dependency is damaging to the precision of estimation of the coefficients in the subset.'

The variance proportions for the %EARN model indicate a linear dependency between the performance variable (0.9885) and the LGSH*PERF covariate (0.5095), with the OD*PERF variable (0.3453) also possibly somewhat involved. The variance proportions for the CHGROE model indicate a linear

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[45]Myers (1990, p. 370) recommends that a condition index in excess of 1,000 be cause for concern about the effect of multicollinearity. SAS, however, prints the square root of the condition index given in Myers (1990), making the rule of thumb approximately 31.6.

dependency between the performance variable (0.9686) and the LGSH*PERF covariate (0.6645) only.

Because the LGSH*PERF covariate is a control variable and not central to the testing of the hypotheses, it was excluded from further analyses in order to eliminate the multicollinearity problem. Although the multicollinearity problem did not appear in the MRET and XRET models, the LGSH*PERF variable was also eliminated from those models for consistency. The collinearity diagnostics were executed again on all models, and the results are displayed in Table 9. Although there appears to be some slight collinearity between the performance variables and the OD*PERF covariate, it is not severe enough to be a cause for concern. The variance inflation factors are now all below ten for all models, and the condition indices are also well below the rule of thumb of approximately 30, indicating that the multicollinearity problem has been mitigated.

After the deletion of the CHMN variable due to the small number of observations for which the CEO was not also the chairman, and the deletion of the LGSH*PERF variable to mitigate the multicollinearity problem, the statistical model originally expressed as Equation (6) in Chapter 4 has been revised. The statistical model used in the remainder of the analyses is expressed in Equation (8) as follows:

Table 9

Collinearity diagnostics after dropping LGSH*PERF: Variance inflation factors, variance proportions, eigenvalues, and condition indices

	PERF = %EARN[a]		PERF = CHGROE[b]		PERF = MRET[b]		PERF = XRET[c]	
Variable	VIF	Var Prop[d]	VIF	Var Prop[d]	VIF	Var Prop[d]	VIF	Var Prop[d]
PERF	7.173	0.9545	6.906	0.9011	6.032	0.9422	4.656	0.9522
OD*PERF	4.970	0.7713	5.806	0.7601	3.414	0.5131	3.062	0.5797
GRWTH	1.067	0.0353	1.049	0.0197	1.036	0.0263	1.025	0.0107
CEOSTK* PERF	1.605	0.0285	1.504	0.1147	3.303	0.2156	2.124	0.0531
ENTRCH* PERF	1.814	0.1561	2.910	0.0227	3.397	0.0002	2.240	0.0630
LGFIRM* PERF	2.501	0.1248	2.100	0.0266	2.832	0.2087	2.211	0.1549
LOCK* PERF	1.343	0.0599	1.329	0.0117	1.422	0.0000	1.266	0.0017
	Eigen-values	Cond. Index	Eigen-values	Cond. Index	Eigen-values	Cond. Index	Eigen-values	Cond. Index
	3.2356	1.0000	3.0735	1.0000	3.4133	1.0000	3.0799	1.0000
	1.2442	1.6126	1.2046	1.5973	1.3962	1.5635	1.4027	1.4818
	0.9795	1.8175	0.9945	1.7580	0.9622	1.8834	0.9877	1.7658
	0.6846	2.1739	0.9072	1.8406	0.6254	2.3361	0.7339	2.0485
	0.4644	2.6397	0.5488	2.3665	0.3190	3.2713	0.3810	2.8433
	0.3043	3.2606	0.1801	4.1308	0.1698	4.4832	0.2682	3.3889
	0.0874	6.0837	0.0912	5.8058	0.1141	5.4699	0.1467	4.5825

[a]Sample size = 654 observations
[b]Sample size = 674 observations
[c]Sample size = 568 observations
[d]Variance proportions are given for the smallest eigenvalue (largest condition index) only.

$$CHGPAY = \beta_0 + \beta_1 PERF + \beta_2 OD*PERF + \beta_3 GRWTH + \beta_4 CEOSTK*PERF + \beta_5 ENTRCH*PERF + \beta_6 LGFIRM*PERF + \beta_7 LOCK*PERF \quad (8)$$

where

CHGPAY = $Ln\{(Salary_t+Bonus_t)/(Salary_{t-1}+Bonus_{t-1})\}$

PERF = The performance variable, either %EARN, CHGROE, MRET, or XRET as previously defined

OD = Dichotomous variable equal to 1 if the percentage of independent outside directors is greater than 50%, 0 otherwise

GRWTH = $Ln(\text{net sales}_t / \text{net sales}_{t-1})$

CEOSTK = Dichotomous variable equal to 1 if the percentage of common stock held by the CEO is at least one percent, 0 otherwise

ENTRCH = Dichotomous variable equal to 1 if the CEO is the founder of the company or has been CEO of the company for 15 or more years, 0 otherwise

LGFIRM = Dichotomous variable equal to 1 if the firm's total assets are larger than the median total assets, 0 otherwise

LOCK = Dichotomous variable equal to 1 if an interlocking directorship is present, 0 otherwise

Influence Diagnostics

In regression analysis, there is a danger that one or a few high influence points may exert undue influence on the regression coefficients and determine the regression results. In order to identify any high influence points, additional regressions were executed separately for each of the performance variable models, using the model specified

in Equation (8) above and the SAS PROC REG procedure along with the P, R, and INFLUENCE options to produce the influence diagnostics. These options generated Cook's D and DFFITS for each observation as well as the DFBETAS for each regression coefficient and observation, along with other output. The high influence observations identified using these diagnostics then warrant investigation as to whether unusual circumstances existed that would make them unrepresentative of the population.

According to Myers (1990, pp. 258-260), the DFFITS for a particular observation represents "the number of estimated standard errors that the fitted value changes" if that observation is excluded from the data set. The DFBETAS for a particular regressor and observation measures "the number of standard errors that the coefficient (on that regressor) changes" if that observation is excluded. The Cook's D statistic for a particular observation provides a measure of the amount of influence that observation exerts on the set of coefficients. While there are contrasting views of appropriate yardsticks for DFFITS, DFBETAS, and Cook's D for determining high influence, Myers (1990) suggests using approximately ± 2.0 for DFFITS and DFBETAS, and

approximately 1.0 for Cook's D.[46] Any observations that exceed these criteria are considered high influence observations and warrant further investigation.

The influence diagnostics from the regressions were analyzed to identify those observations which exceeded the criteria for Cook's D, DFFITS, and/or DFBETAS. Due to the high volume of influence statistics generated, the Cook's D, DFFITS, and DFBETAS measures shown in Tables 10 and 11 are only for those observations that exceeded the criteria for at least one of the models. For those high influence observations, the influence diagnostics are shown in Tables 10 and 11 for all models, even though the high influence criteria were exceeded in only one or two of the models. Table 10 shows the influence diagnostics for the %EARN and CHGROE models, and Table 11 shows the influence diagnostics for the MRET and XRET models. Although the regression results were not interpreted at this point, the results are shown in Appendix B, Table B5, for comparison with the final results to illustrate how much the results can be affected by a few highly influential points.

The initial analysis of the influence diagnostics produced three high influence observations, shown in Tables

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[46]Myers' (1990) suggestion is based on using the 50% point of the $F_{p,n-p}$ distribution as the value for Cook's D, which in this case would be approximately 0.92 for $F_{8,\infty}$.

Table 10

Influence diagnostics on %EARN and CHGROE models: DFFITS, Cook's D, and DFBETAS for observations that exceed criteria[a]

Model/ Variables	General Cinema 90-91	Pola-roid 90-91	Paine Webber 90-91	Ceri-dian 88-89[b]	Gil-lette 88-89[b]
PERF=%EARN:					
DFFITS	2.919[c]	-0.856	1.580	N/A[d]	0.019
Cook's D	1.047[c]	0.091	0.295		0.000
DFBETAS:					
Intercept	-0.217	-0.115	0.077		0.017
%EARN	0.896	-0.339	0.488		-0.002
OD*PERF	-0.613	-0.233	-0.628		0.002
GRWTH	0.625	0.098	-0.146		-0.003
CEOSTK*PERF	-1.030	0.003	1.145		-0.004
ENTRCH*PERF	-0.788	0.220	-0.747		0.004
LGFIRM*PERF	-0.524	0.601	0.294		-0.001
LOCK*PERF	-1.320	0.042	-0.250		0.001
PERF=CHGROE					
DFFITS	2.363[c]	-3.036[c]	1.413	2.423[c]	5.403[c]
Cook's D	0.684	1.130[c]	0.247	0.729	3.633[c]
DFBETAS:					
Intercept	-0.157	-0.230	0.144	0.126	0.023
CHGROE	0.791	-1.107	0.218	-2.403[c]	0.300
OD*PERF	-0.526	-1.318	-0.143	1.270	-1.295
GRWTH	0.687	0.229	-0.230	0.009	0.119
CEOSTK*PERF	-1.370	-0.683	1.114	0.439	0.680
ENTRCH*PERF	-0.375	2.369[c]	-0.284	1.132	-1.882
LGFIRM*PERF	-0.466	1.994	0.313	1.042	0.845
LOCK*PERF	-0.792	0.220	-0.583	0.073	0.287

[a]The criteria are: DFFITS and DFBETAS, ± 2.0; Cook's D, 1.0.

[b]These observations met the criteria for the CHGROE model after the first 4 observations were excluded.

[c]Exceeds high influence criteria.

[d]Observation lost when %EARN > 5 or < -5 eliminated for %EARN model.

Table 11

Influence diagnostics on MRET and XRET models: DFFITS, Cook's D, and DFBETAS for observations that exceed criteria[a]

Model/ Variables	General Cinema 90-91	Pola-roid 90-91	Paine Webber 90-91	Ceri-dian 88-89[b]	Gil-lette 88-89[b]
PERF=MRET:					
DFFITS	-0.070	-0.064	2.916[c]	0.026	-0.010
Cook's D	0.001	0.001	1.040[c]	0.000	0.000
DFBETAS:					
Intercept	0.009	-0.042	-0.038	0.012	0.010
MRET	-0.020	0.020	0.217	-0.020	0.003
OD*PERF	0.011	0.019	-0.666	0.012	0.005
GRWTH	-0.051	0.009	0.049	-0.012	-0.003
CEOSTK*PERF	0.013	0.003	2.250[c]	0.004	-0.019
ENTRCH*PERF	0.009	-0.015	-1.775	0.005	0.021
LGFIRM*PERF	0.014	-0.032	0.838	0.009	-0.007
LOCK*PERF	0.025	-0.005	-0.359	0.002	-0.005
PERF=XRET:					
DFFITS	-0.016	-0.105	2.363[c]	-0.003	-0.011
Cook's D	0.000	0.001	0.663	0.000	0.000
DFBETAS:					
Intercept	0.002	-0.023	0.169	-0.001	-0.004
XRET	-0.007	0.039	0.319	0.002	0.000
OD*PERF	0.004	0.045	-0.500	-0.002	-0.003
GRWTH	-0.009	0.001	-0.002	0.001	0.001
CEOSTK*PERF	0.006	0.006	1.930	-0.000	0.006
ENTRCH*PERF	0.003	-0.024	0.001	-0.001	-0.009
LGFIRM*PERF	0.004	-0.070	-0.009	-0.001	0.002
LOCK*PERF	0.006	-0.025	0.006	-0.000	0.002

[a]The criteria are: DFFITS and DFBETAS, ± 2.0; Cook's D, 1.0.

[b]These observations met the criteria for the CHGROE model after the first 4 observations were excluded.

[c]Exceeds high influence criteria.

10 and 11. One observation, General Cinema for the year-change 1990-1991, exceeded both the DFFITS and the Cook's D criteria for the %EARN model. Two high influence observations were identified for the CHGROE model. General Cinema 90-91 exceeded the DFFITS criteria only, and Polaroid 90-91 exceeded the criteria for the DFFITS, Cook's D, and one of the DFBETAS. For the MRET and XRET models, shown in Table 11, the only high influence observation identified was Paine Webber 90-91. For that observation, the DFFITS, Cook's D, and one of the DFBETAS exceeded the criteria in the MRET model, but only the DFFITS criteria was exceeded in the XRET model. There were no observations for which DFBETAS for a regressor exceeded the ± 2.0 criteria that did not also exceed the criteria for DFFITS and/or Cook's D.

Once these observations and years were identified, the Dow Jones News Retrieval was used to search The Wall Street Journal for any unusual events or circumstances that had occurred during these time frames for these firms. The firms' annual reports on WestLaw were also examined.

For General Cinema, it was discovered that the company merged with Harcourt Brace at their fiscal year-end of 10/31/91. The merger was accounted for as a pooling of interests in the fiscal 1991 annual report. Because this caused a significant change in the company, the General Cinema 90-91 year-change was dropped from the analyses for

all models.

In the third quarter of 1991, Polaroid reported a $925 million pretax gain from a patent infringement settlement with Eastman Kodak. In 1990, Paine Webber reported a $149 million charge for troubled "bridge" loans and layoffs as well as a $111 million increase in reserves for merchant banking investments. The chairman of Paine Webber was quoted as saying that these charges were taken in part "to 'liquify' its balance sheet and position it for the future." Because of these unusual circumstances, the Polaroid 90-91 and Paine Webber 90-91 year-changes were dropped from the analyses for all models. Although Paine Webber 89-90 was not identified as a high influence observation, the charges in 1990 would also affect the 89-90 year-change, and thus, that observation was also dropped from the analyses.

After these four high influence observations (General Cinema 90-91, Polaroid 90-91, and Paine Webber 89-90 and 90-91) were dropped from the analyses, the regressions were repeated and influence diagnostics analyzed for any additional high influence observations. Two additional observations were identified for the CHGROE model that exceeded the high influence criteria. Ceridian (formerly Control Data) 88-89 exceeded the criteria for DFFITS and one of the DFBETAS, and Gillette exceeded the criteria for both DFFITS and Cook's D. Ceridian 88-89 was not included in the

%EARN model because that observation was lost when those for which the percentage change in earnings was greater than 5.0 or less than -5.0 were dropped from the %EARN analyses.[47]

From the search on the Dow Jones News Retrieval, The Wall Street Journal announced the change in CEO for Ceridian on 12/7/89, prior to year-end. Only the 89-90 year-change was previously dropped from the data set due to the change in CEO because it was assumed from the proxy that the change occurred after year-end, at the beginning of 1990. Because the change in CEO appears to have occurred prior to year-end, the 88-89 year-change was also affected. Thus, Ceridian 88-89 was excluded from the analyses for all models.

From The Wall Street Journal and annual report, Gillette experienced a buy-back of common shares as part of an agreement to settle a proxy contest in 1988. This caused their average common equity to be negative and near zero for 88-89, making the CHGROE variable negative and large.[48] From a review of the raw data, this was the only observation in the data set for which average common equity was negative. Gillette 88-89 was, therefore, dropped from the

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[47]See the "Continuous Variables" subsection of the "Data Description" section of this chapter for the discussion regarding the percentage change in earnings.

[48]See Equation (3) in Chapter 4 for the calculation of CHGROE.

CHGROE analyses. It was excluded from the CHGROE model only because the other models would not be affected by the average common equity calculation.

After dropping Ceridian 88-89 from the CHGROE, MRET, and XRET models, and Gillette 88-89 from the CHGROE model, the regressions were repeated and the influence diagnostics were once again examined. No additional high influence observations were identified. The revised sample sizes for each model are shown in Table 12, beginning with the sample size of 674 derived earlier in Table 3.

Heteroscedasticity

The tests for violation of the homogeneous variance assumption, or heteroscedasticity, were executed using the SPEC option in the SAS PROC REG procedure for each performance variable model regression. This option produces a chi-square test of the first and second moment specification. The chi-square values and p-values for these tests are shown in Table 13. None of the tests are significant at a 0.05 level. While the CHGROE model is the closest to being significant, it is not considered severe enough to pose a problem. Plots of the residuals against the predicted values for each of the performance models also did not reveal any noticeable trends or heterogeneous

Table 12

Revised sample size for each performance variable model

	Performance variable model			
	%EARN	CHGROE	MRET	XRET
Sample size from Table 3	674	674	674	674
Lost due to large %EARN	- 20			
XRET unavailable for NASDAQ firms				-106
High influence observations	- 4	- 6	- 5	- 5
Total sample size	650	668	669	563

Table 13

Test of first and second moment specification (heteroscedasticity)

Model	Chi-square value	p-value
%EARN	29.8810	0.4718
CHGROE	41.9676	0.0720
MRET	36.3691	0.1962
XRET	34.7534	0.2517

variance. It appears, therefore, that the homogeneous variance assumption was not violated in these models.

Tests of Hypotheses

Upon completion of the diagnostic tests described in the preceding section, the hypotheses stated in Chapter 3 were tested using the regressions executed on the statistical model in Equation (8) for each performance variable model. The results of these tests are described in this section.

Tests of Hypothesis 1

In Hypothesis 1, it was predicted that there would be a significant positive relationship between the change in CEO salary and bonus compensation and firm performance for firms with outsider-dominated boards. This hypothesis was developed to establish a significant pay-performance link for outsider-dominated firms prior to the comparison with insider-dominated firms in Hypothesis 2.

Because the prediction in Hypothesis 1 is for outsider-dominated boards, the regressions were executed on the outsider-dominated subsample only using Equation (8) with

the OD*PERF variable excluded. Support for Hypothesis 1 for each of the models is provided by a significant positive coefficient for the PERF regressor (β_1). The regression results for each of the performance variable models are displayed in Table 14.

For the %EARN model, the coefficient on PERF was 0.0959, which was significant at a 0.01 level (t-statistic 5.827, p-value <0.0001). This provides support for H_{1a} that there is a significant positive relationship between the change in CEO compensation and the percentage change in earnings for firms with outsider-dominated boards.

The coefficient on PERF for the CHGROE model was 0.8913. This was also significant at a 0.01 level, with a t-statistic of 5.047 and p-value <0.0001. H_{1b}, that there is a significant positive relationship between the change in CEO compensation and the change in earnings weighted by common equity for firms with outsider-dominated boards, is thus supported.

For the MRET model, the PERF coefficient of 0.2325 was significant at a 0.01 level (t-statistic 4.075, p-value <0.0001), supporting H_{1c}. Hypothesis 1c predicted that there is a significant positive relationship between the change in CEO compensation and market-adjusted returns for firms with outsider-dominated boards.

Finally, the coefficient on PERF of 0.2727 for the XRET

Table 14

Regression results for testing hypothesis 1, outsider-dominated subsample only[a]

Regressor	PERF = %EARN	PERF = CHGROE	PERF = MRET	PERF = XRET
β_0 Intercept	0.0636	0.0647	0.0541	0.0765
t-statistic	6.112[d]	6.346[d]	5.164[d]	6.857[d]
p-value[c]	<0.0001	<0.0001	<0.0001	<0.0001
β_1 PERF	0.0959	0.8913	0.2325	0.2727
t-statistic	5.827[d]	5.047[d]	4.075[d]	4.277[d]
p-value[b]	<0.0001	<0.0001	<0.0001	<0.0001
β_2 GRWTH	0.0796	0.0729	0.2399	0.1366
t-statistic	1.009	0.929	3.021[d]	1.606[f]
p-value[b]	0.1569	0.1768	0.0014	0.0546
β_3 CEOSTK*PERF	0.0006	0.5102	-0.0186	-0.0259
t-statistic	0.012	0.844	-0.150	-0.146
p-value[c]	0.9908	0.3994	0.8810	0.8842
β_4 ENTRCH*PERF	-0.0213	-0.2000	-0.0397	-0.0964
t-statistic	-0.536	-0.674	-0.350	-0.734
p-value[b]	0.2960	0.2505	0.3631	0.2318
β_5 LGFIRM*PERF	-0.0471	-0.3812	-0.0158	0.0254
t-statistic	-2.264[e]	-1.917[f]	-0.236	0.338
p-value[c]	0.0241	0.0559	0.8139	0.7356
β_6 LOCK*PERF	0.1116	0.5445	0.0183	0.0733
t-statistic	3.265[d]	2.339[d]	0.217	0.805
p-value[b]	0.0006	0.0099	0.4140	0.2108
F-statistic	13.474	13.628	9.660	11.090
p-value	<0.0001	<0.0001	<0.0001	<0.0001
Adjusted R^2	0.1448	0.1427	0.1025	0.1409
Sample Size	443	456	456	370

[a]Regression model: $CHGPAY=\beta_0+\beta_1 PERF+\beta_2 GRWTH+\beta_3 CEOSTK*PERF+\beta_4 ENTRCH*PERF+\beta_5 LGFIRM*PERF+\beta_6 LOCK*PERF$

[b]1-tail test

[c]2-tail test, no direction predicted

[d]Significant at 0.01 level

[e]Significant at 0.05 level

[f]Significant at 0.10 level

model was also significant at the 0.01 level, with a t-statistic of 4.277 and p-value <0.0001. This provides support for H_{1d} that there is a significant positive relationship between the change in CEO compensation and excess returns for firms with outsider-dominated boards.

Hypothesis 1 is therefore supported for each of the performance variable models. Based on these results, there is a significant positive relationship between the change in CEO compensation and firm performance for firms with outsider-dominated boards. These results are consistent with the findings of previous studies of a positive link between CEO compensation and performance, although previous studies did not consider the composition of the board.

After establishing that there is a positive pay-performance link for firms with outsider-dominated boards, the next question is whether that relationship differs between firms with outsider-dominated boards and those with insider-dominated boards. This question is addressed in Hypothesis 2.

Tests of Hypothesis 2

A stronger association between the change in CEO compensation and firm performance is predicted in Hypothesis 2 for firms with outside-dominated boards than those with

insider-dominated boards. As discussed in the "Statistical Analysis" section of Chapter 4, a single regression with indicator variables was used rather than fitting separate regressions for outsider-dominated and insider-dominated firms due to certain advantages of that technique.[49] The test for this hypothesis is provided by a significant positive coefficient on the OD*PERF regressor (β_2) in Equation (8), which in effect tests whether regressions on outsider-dominated and insider-dominated subsamples have the same slope.

In Table 15, the OD*PERF coefficient, β_2, was -0.0254 (t-statistic -1.047, p-value 0.1478) for the %EARN model. The sign on the coefficient was negative, which was opposite the expected direction. Thus, H_{2a} is not supported. There does not appear to be a stronger association between the change in CEO compensation and the percentage change in earnings when the board is dominated by outsiders.

For the CHGROE model in Table 15, the β_2 coefficient on the OD*PERF regressor was 0.1456 (t-statistic 0.714, p-value 0.2379). The coefficient was positive, which was in the expected direction, but was not statistically significant. Hypothesis 2b, that there is a stronger association between

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[49]See Appendix C and Neter et al. (1990, pp. 349-360) for a discussion of the use of indicator variables in multiple regression.

Table 15

Regression results for testing hypothesis 2[a]

Regressor	PERF = %EARN	PERF = CHGROE	PERF = MRET	PERF = XRET
β_0 Intercept	0.0576	0.0576	0.0521	0.0690
t-statistic	6.568[d]	6.697[d]	5.838[d]	7.151[d]
p-value[c]	<0.0001	<0.0001	<0.0001	<0.0001
β_1 PERF	0.1116	0.6697	0.1740	0.1390
t-statistic	4.453[d]	3.136[d]	2.701[d]	1.938[e]
p-value[b]	<0.0001	0.0009	0.0036	0.0266
β_2 OD*PERF	-0.0254	0.1456	0.0681	0.1428
t-statistic	-1.047	0.714	1.120	1.967[e]
p-value[b]	0.1478	0.2379	0.1316	0.0249
β_3 GRWTH	0.1273	0.1405	0.2627	0.2038
t-statistic	2.335[d]	2.613[d]	4.837[d]	3.445[d]
p-value[b]	0.0100	0.0046	<0.0001	0.0003
β_4 CEOSTK*PERF	0.1258	1.3294	0.0574	0.0205
t-statistic	3.198[d]	4.326[d]	0.559	0.159
p-value[c]	0.0015	<0.0001	0.5765	0.8734
β_5 ENTRCH*PERF	-0.0296	-0.4387	-0.0414	0.0281
t-statistic	-1.004	-1.923[e]	-0.422	0.252
p-value[b]	0.1578	0.0275	0.3367	0.4006
β_6 LGFIRM*PERF	-0.0401	-0.2444	-0.0407	-0.0010
t-statistic	-2.077[e]	-1.344	-0.682	-0.015
p-value[c]	0.0382	0.1795	0.4955	0.9881
β_7 LOCK*PERF	0.0884	0.3499	-0.0042	-0.0030
t-statistic	2.683[d]	1.645	-0.060	-0.037
p-value[b]	0.0038	0.0503	0.4760	0.4853
F-statistic	18.825	19.451	12.190	10.591
p-value	<0.0001	<0.0001	<0.0001	<0.0001
Adjusted R^2	0.1613	0.1622	0.1050	0.1067
Sample Size	650	668	669	563

[a]Regression model: $CHGPAY=\beta_0+\beta_1 PERF+\beta_2 OD*PERF+\beta_3 GRWTH+\beta_4 CEOSTK*PERF+\beta_5 ENTRCH*PERF+\beta_6 LGFIRM*PERF+\beta_7 LOCK*PERF$

[b]1-tail test

[c]2-tail test, no direction predicted

[d]Significant at 0.01 level

[e]Significant at 0.05 level

the change in CEO compensation and the change in earnings weighted by common equity when the board is dominated by outsiders, is therefore not supported.

The β_2 coefficient on the OD*PERF regressor for the MRET model in Table 15 was 0.0681 (t-statistic 1.120, p-value 0.1316). The coefficient was positive but not statistically significant at a 0.10 alpha level. It could, however, be considered significant at a 0.15 level, which provides some weak evidence in support of Hypothesis 2c that there is a stronger association between the change in CEO compensation and market-adjusted returns when the board is dominated by outsiders.

For the XRET model in Table 15, the β_2 coefficient on the OD*PERF regressor was 0.1428 (t-statistic 1.967, p-value 0.0249). The coefficient was positive and statistically significant at a 0.05 alpha level. This provides evidence in support of Hypothesis 2d, that there is a stronger association between the change in CEO compensation and excess returns when the board is dominated by outsiders.

In conclusion, Hypothesis 2 was supported only when the performance measure was excess returns, although some weak evidence was found when the performance measure was market-adjusted returns. No evidence of a stronger association between CEO pay and performance for outsider-dominated firms was found for the accounting measures of performance, either

for the percentage change in earnings or for the change in earnings weighted by common equity.

Before reporting tests of Hypothesis 3, the coefficients on the control variables and the intercept are discussed in the next two sections.

Control Variable Coefficients

As discussed in the "Statistical Analysis" section of Chapter 4, the signs on the coefficients for the control variables were expected to be positive for GRWTH and negative for ENTRCH*PERF and LOCK*PERF, with no sign predicted for CEOSTK*PERF and LGFIRM*PERF.

Because of the findings in prior studies of a positive relationship between the level of CEO compensation and firm size [e.g., Murphy (1985)], a positive association was expected between the change in CEO pay and growth. The coefficient on GRWTH (β_3) was thus expected to be positive. In Table 15, the coefficient on GRWTH was positive and statistically significant at a 0.01 level for all performance variable models, consistent with expectations.

The pay-performance relationship was expected to be weaker when the CEO was entrenched, resulting in the expectation of a negative coefficient on the ENTRCH*PERF variable (β_5). From Table 15, β_5 was negative for the

%EARN, CHGROE, and MRET models. The coefficient was statistically significant at a 0.05 level for the CHGROE model only. Although the coefficient was positive for the XRET model, it was very nearly zero. These results were thus consistent with expectations for all models except the XRET model.

The presence of an interlocking directorship was also expected to make the pay-performance relationship weaker. The coefficient (β_7) on the LOCK*PERF variable was thus expected to be negative. The coefficients on LOCK*PERF in Table 15 were negative for the MRET and XRET models only. They were, however, not statistically significant. The coefficients were positive for the %EARN and CHGROE models, which was opposite the expectations. The results were, for the most part, not consistent with the expectations. The presence of an interlocking directorship does not appear to weaken the pay-performance relationship.

No expectation was given for the sign of the coefficient (β_4) on the CEOSTK*PERF variable. From Table 15, the coefficient on CEOSTK*PERF was positive for all models and statistically significant at a 0.01 level (two-tailed) for the accounting models, %EARN and CHGROE. This result is consistent with one of the arguments by Sloan (1993), that the association between cash compensation and earnings performance will be stronger in order to shield the

CEO from market fluctuations. The same argument would not be valid for the stock return measures of performance.

No expectation was given for the sign of the coefficient (β_6) on the LGFIRM*PERF variable. The coefficients in Table 15 were negative for all performance variable models, although only the coefficient for the %EARN model was statistically significant at a 0.05 level (two-tailed). This would seem to imply that the pay-performance relationship was weaker for larger firms, at least for the %EARN model.

Although not necessarily statistically significant, the signs on the coefficients of the control variables were, for the most part, consistent with expectations. Only the coefficient on ENTRCH*PERF for the XRET model and the coefficients on LOCK*PERF for the %EARN and CHGROE models were opposite of the expected sign.

Intercept

By using only one constant (β_0) in the regression model in Table 15 instead of a constant for each dichotomous variable, the intercept is constrained to be the same for all subsamples represented by indicator variables. In order to ensure that the intercept did not differ among subsamples, the regression for each performance variable

model was repeated with constants included for the dichotomous variables. For these regressions, the statistical model in Equation (8) becomes the following model:

$$\begin{aligned} CHGPAY = {} & \delta_0 + \delta_1 OD + \delta_2 CEOSTK + \delta_3 ENTRCH + \delta_4 LGFIRM + \delta_5 LOCK \\ & + \delta_6 PERF + \delta_7 OD*PERF + \delta_8 GRWTH + \delta_9 CEOSTK*PERF + \\ & \delta_{10} ENTRCH*PERF + \delta_{11} LGFIRM*PERF + \delta_{12} LOCK*PERF \end{aligned} \quad (9)$$

where all variables are as previously defined in Equation (8).

The results of these regressions are displayed in Table 16. The intercept (δ_0) remained statistically significant for all performance variable models while none of the coefficients on the dichotomous variable constants (OD, CEOSTK, ENTRCH, LGFIRM, LOCK) were statistically significant. It is also important to note that the coefficients, t-statistics, and p-values on the remaining variables in Table 16 remained very similar to the results in Table 15. Therefore, the intercept does not appear to differ among indicator variable subsamples, and the regression model is valid when the intercept is constrained to be the same by using only one constant in the model.

Tests of Hypothesis 3

As discussed in Chapter 3, it was predicted in

Table 16
Regressions including constants for indicator variables

Regressor	%EARN	CHGROE	MRET	XRET
δ_0 Intercept	0.0583	0.0542	0.0563	0.0603
t-statistic	3.271	3.057	3.074	3.062
p-value	0.0011	0.0023	0.0022	0.0023
δ_1 OD	-0.0059	-0.0006	-0.0013	0.0109
t-statistic	-0.342	-0.032	-0.072	0.565
p-value	0.7328	0.9743	0.9423	0.5724
δ_2 CEOSTK	-0.0204	-0.0137	-0.0128	-0.0028
t-statistic	-0.835	-0.559	-0.515	-0.100
p-value	0.4042	0.5765	0.6071	0.9202
δ_3 ENTRCH	0.0040	-0.0020	-0.0010	0.0087
t-statistic	0.180	-0.090	-0.045	0.349
p-value	0.8569	0.9284	0.9643	0.7271
δ_4 LGFIRM	0.0047	0.0065	-0.0044	-0.0024
t-statistic	0.302	0.417	-0.274	-0.137
p-value	0.7629	0.6766	0.7843	0.8910
δ_5 LOCK	0.0149	0.0131	0.0055	0.0051
t-statistic	0.846	0.753	0.304	0.256
p-value	0.3978	0.4518	0.7614	0.7978
δ_6 PERF	0.1117	0.6789	0.1762	0.1320
t-statistic	4.436	3.152	2.722	1.801
p-value[b]	<0.0001	0.0009	0.0034	0.0362
δ_7 OD*PERF	-0.0248	0.1461	0.0667	0.1533
t-statistic	-1.015	0.711	1.088	2.035
p-value[b]	0.1553	0.2388	0.1386	0.0212
δ_8 GRWTH	0.1325	0.1465	0.2675	0.2052
t-statistic	2.386	2.684	4.834	3.419
p-value[b]	0.0087	0.0038	<0.0001	0.0004
δ_9 CEOSTK*PERF	0.1321	1.3777	0.0604	0.0179
t-statistic	3.309	4.387	0.585	0.137
p-value[c]	0.0010	<0.0001	0.5589	0.8911
δ_{10} ENTRCH*PERF	-0.0311	-0.4485	-0.0445	0.0372
t-statistic	-1.051	-1.941	-0.450	0.324
p-value[b]	0.1470	0.0263	0.3263	0.3729
δ_{11} LGFIRM*PERF	-0.0407	-0.2527	-0.0413	-0.0038
t-statistic	-2.100	-1.384	-0.690	-0.055
p-value[c]	0.0361	0.1667	0.4907	0.9563
δ_{12} LOCK*PERF	0.0894	0.3362	-0.0015	-0.0014
t-statistic	2.700	1.573	-0.022	-0.016
p-value[b]	0.0036	0.0582	0.4912	0.4936
F-statistic	11.076	11.421	7.108	6.178
p-value	<0.0001	<0.0001	<0.0001	<0.0001
Adjusted R^2	0.1570	0.1579	0.0989	0.0996

Hypothesis 3 that outsider-dominated and insider-dominated boards would differ in the type of performance measure, accounting and stock return, emphasized in the relationship between the change in CEO compensation and firm performance. More specifically, as advocates for the shareholders, outsider-dominated boards may consider stock return measures of performance in addition to, or instead of, accounting measures of performance. Insiders, however, may prefer accounting measures because they have more control over accounting measures than stock returns.

As discussed in the "Statistical Analysis" section of Chapter 4, no direct test was used for Hypothesis 3. Rather, the sample was divided into two subsamples, outsider-dominated and insider-dominated. The hypothesis was then tested indirectly by testing whether there was significant additional explanatory power when each type of performance measure, accounting or stock return, was added to the model containing the other type of performance measure for each subsample. This was repeated for each combination of accounting and stock return measures for each subsample. These combinations included: (1) adding MRET to the %EARN model and then adding %EARN to the MRET model, (2) adding XRET to the %EARN model and then adding %EARN to the XRET model, (3) adding MRET to the CHGROE model and then adding CHGROE to the MRET model, (4) adding XRET to the

CHGROE model and then adding CHGROE to the XRET model. The extra sum of squares principle [Myers (1990)] was then used to test whether the addition of the performance measure to the model (e.g., adding MRET to the %EARN model) adds significant explanatory power. The extra sum of squares principle involves an F-test that compares the sum of squares error for the "full" model to the "reduced" model. The model without the additional performance variable added is considered the "reduced" model, expressed as Equation (10) below, while the model with the added performance variable is considered the "full" model, expressed below as Equation (11). The regression model used is essentially Equation (8) with the OD*PERF variable omitted. The OD*PERF variable is no longer needed in the model because the sample was divided into the outsider-dominated and insider-dominated subsamples. The "reduced" model then follows as Equation (10):

$$\text{CHGPAY} = \alpha_0 + \alpha_1\text{PERF} + \alpha_2\text{GRWTH} + \alpha_3\text{CEOSTK*PERF} + \alpha_4\text{ENTRCH*PERF} + \alpha_5\text{LGFIRM*PERF} + \alpha_6\text{LOCK*PERF} \quad (10)$$

where all variables are as previously defined in Equation (8).

The "full" model then follows as Equation (11):

$$CHGPAY = \omega_0 + \omega_1 PERF + \omega_2 GRWTH + \omega_3 CEOSTK*PERF + \omega_4 ENTRCH*PERF + \omega_5 LGFIRM*PERF + \omega_6 LOCK*PERF + \omega_7 PERF2 \quad (11)$$

where all variables are as previously defined in Equation (8), except

PERF2 = The added performance variable, either %EARN, CHGROE, MRET, or XRET

For these tests, the F-statistic for the extra sum of squares is referred to as the F^*-statistic to differentiate it from the F-statistic for the regression model. The formula to calculate the F^*-statistic is:

$$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})} \sim F_{(\Delta df, dfFULL)} \quad (12)$$

where

SSE = sum of squares error for the reduced and full models, respectively

MSE_{full} = mean square error for the full model

Δdf = the difference in the error degrees of freedom between the full and reduced models

df_{FULL} = error degrees of freedom for the full model

In this case, the difference in the error degrees of freedom between the full and reduced models was one because only one variable was added for all comparisons.

The critical values for the F^*-statistic are given

below:[50]

Alpha Level	$F^{*}_{(1,\infty)}$ Critical Value
0.10	2.71
0.05	3.84
0.01	6.63
0.001	10.80

These critical values were then used to assess the significance of the F^{*}-statistic for each of the performance measure combinations in Tables 18 - 25.

Collinearity between accounting and stock return measures. One concern when including accounting and stock returns in the same regression model is that there may be problems with collinearity. The variance inflation factors (VIFs) were again generated using the VIF and COLLINOINT options in the SAS PROC REG procedure for each of the regressions in which both accounting and stock return measures were included. The variance inflation factors for each variable in each of the performance measure combinations are displayed in Table 17.

None of the variance inflation factors exceeded the rule of thumb of ten for any of the performance measure

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[50]Critical values were obtained from Neter et al. (1990, p. 1136). In the table, the denominator degrees of freedom jump from 120 to ∞. The error degrees of freedom for all performance measure combination regressions exceed 120; therefore, ∞ was used.

Table 17

Variance inflation factors for combined accounting and stock return models

Variable	PERF = %EARN				PERF = CHGROE			
	Out	In	Out	In	Out	In	Out	In
PERF	2.884	6.214	2.656	6.370	4.276	7.905	4.658	7.552
GRWTH	1.069	1.170	1.096	1.092	1.072	1.113	1.079	1.042
CEOSTK*PERF	1.771	1.539	1.228	1.262	1.324	1.985	1.284	1.347
ENTRCH*PERF	1.765	4.234	1.227	3.913	1.340	5.945	1.305	4.955
LGFIRM*PERF	2.742	3.107	2.537	3.356	3.926	3.051	4.189	3.250
LOCK*PERF	1.196	1.111	1.176	1.071	1.303	1.357	1.306	1.126
MRET	1.121	1.198			1.131	1.367		
XRET			1.070	1.162			1.135	1.259
Variable	**PERF = MRET**				**PERF = XRET**			
	Out	In	Out	In	Out	In	Out	In
PERF	3.622	5.109	3.583	5.012	2.678	3.087	2.857	3.142
GRWTH	1.081	1.141	1.089	1.087	1.065	1.086	1.059	1.040
CEOSTK*PERF	2.609	6.446	2.627	6.662	1.272	3.686	1.283	4.170
ENTRCH*PERF	2.863	7.262	2.866	7.526	1.382	4.344	1.386	4.844
LGFIRM*PERF	3.157	2.491	3.201	2.441	2.283	1.865	2.471	1.799
LOCK*PERF	1.455	1.576	1.437	1.554	1.311	1.247	1.297	1.236
%EARN	1.136	1.299			1.086	1.296		
CHGROE			1.174	1.432			1.180	1.441

combinations in Table 17.[51] Therefore, collinearity between the accounting and stock return measures does not appear to be a problem.

%EARN and MRET Combination. The results of the regressions for the combination of the %EARN and MRET performance variables are shown in Tables 18 and 19. In Table 18, the regression results are shown first for the %EARN model only (Equation (10) with PERF = %EARN) and then for the %EARN model with the MRET performance variable added (Equation (11) with PERF2 = MRET) for each subsample, outsider-dominated and insider-dominated. The regression results for the MRET model only (Equation (10), PERF = MRET) and the MRET model with %EARN added (Equation (11), PERF2 = %EARN) for each subsample are displayed in Table 19.

In Table 18, the addition of the market-adjusted return (MRET) performance variable to the %EARN model resulted in significant additional explanatory power for the outsider-dominated subsample. The F^*-statistic was 27.5521, which was statistically significant at a 0.001 level ($F^*_{0.001(1,\infty)}$ = 10.80). There was also a corresponding rise in the adjusted R^2 from 0.1448 to 0.1939. Contrarily, the additional

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[51]See the "Multicollinearity" subsection of the "Diagnostics" section of this chapter for further discussion of the rule of thumb for variance inflation factors.

Table 18

Regression results for %EARN model with MRET added

Regressor	Outsider-dominated		Insider-dominated	
	%EARN only	MRET added	%EARN only	MRET added
Intercept	0.0636	0.0601	0.0550	0.0549
t-statistic	6.112	5.935	3.320	3.317
%EARN	0.0959	0.0845	0.0594	0.0517
t-statistic	5.827	5.242	1.158	0.998
GRWTH	0.0796	0.1321	0.1160	0.1141
t-statistic	1.009	1.709	1.451	1.426
CEOSTK*%EARN	0.0006	-0.0162	0.2813	0.2700
t-statistic	0.012	-0.314	4.470	4.232
ENTRCH*%EARN	-0.0213	-0.0332	0.0073	0.0098
t-statistic	-0.536	-0.857	0.120	0.160
LGFIRM*%EARN	-0.0471	-0.0498	-0.0065	-0.0033
t-statistic	-2.264	-2.466	-0.108	-0.056
LOCK*%EARN	0.1116	0.1072	0.0475	0.0347
t-statistic	3.265	3.228	0.512	0.371
MRET		0.1644		0.0556
t-statistic		5.249		1.054
F-statistic for model	13.474	16.189	10.919	9.523
Adjusted R^2	0.1448	0.1939	0.2241	0.2246
Sample Size	443	443	207	207
Sum of squares error	14.25116	13.40228	8.51690	8.46959
Mean square error		0.03081		0.04258
F^*-statistic[a]		27.5521[b]		1.1116

[a]Calculation: $$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})}$$

[b]Significant at < 0.001 level

explanatory power was not significant when the market-adjusted return performance variable was added to the %EARN model for the insider-dominated subsample. The F^*-statistic of 1.1116 was not statistically significant compared to the critical value for $F^*_{(1,\infty)}$ of 2.71 at a 0.10 level, and the increase in the adjusted R^2 was minimal.

When the accounting performance variable, %EARN, was added to the MRET model, however, the additional explanatory power was significant for both outsider-dominated and insider-dominated subsamples. As shown in Table 19, the F^*-statistic was 34.4515 for the outsider-dominated subsample and 14.7974 for the insider-dominated subsample, both of which were statistically significant at a 0.001 level ($F^*_{0.001(1,\infty)} = 10.80$). The adjusted R^2 also showed a corresponding increase for each subsample, from 0.1021 to 0.1661 for outsider-dominated and from 0.0955 to 0.1538 for insider-dominated.

Based on these results, both the percentage change in earnings and the market-adjusted returns provided significant additional explanatory power when added to the model containing the other variable for the outsider-dominated subsample. For the insider-dominated subsample, however, only the percentage change in earnings provided additional explanatory power in the presence of the market-adjusted returns. Market-adjusted returns did not provide

Table 19

Regression results for MRET model with %EARN added

	Outsider-dominated		Insider-dominated	
Regressor	MRET only	%EARN added	MRET only	%EARN added
Intercept	0.0519	0.0582	0.0441	0.0486
t-statistic	4.882	5.650	2.459	2.799
MRET	0.2472	0.1930	0.1833	0.1030
t-statistic	4.217	3.371	1.584	0.904
GRWTH	0.2439	0.1456	0.2621	0.1763
t-statistic	3.043	1.842	3.192	2.137
CEOSTK*MRET	-0.0134	-0.0075	0.1631	0.3210
t-statistic	-0.108	-0.063	0.850	1.690
ENTRCH*MRET	-0.0500	-0.0744	-0.0808	-0.2292
t-statistic	-0.442	-0.682	-0.399	-1.147
LGFIRM*MRET	-0.0274	-0.0312	-0.1087	-0.1016
t-statistic	-0.399	-0.471	-0.781	-0.755
LOCK*MRET	0.0051	0.0391	-0.0654	-0.0273
t-statistic	0.061	0.477	-0.503	-0.217
%EARN		0.0604		0.0952
t-statistic		5.869		3.847
F-statistic for model	9.378	13.576	4.623	6.350
Adjusted R^2	0.1021	0.1661	0.0955	0.1538
Sample Size	443	443	207	207
Sum of squares error	14.96274	13.86477	9.92970	9.24251
Mean square error		0.03187		0.04644
F^*-statistic[a]		34.4515[b]		14.7974[b]

[a]Calculation: $$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})}$$

[b]Significant at < 0.001 level

significant additional explanatory power in the presence of the percentage change in earnings for the insider-dominated subsample. These results support Hypothesis 3a, that outsider-dominated and insider-dominated boards differ in the type of performance measure emphasized in the compensation-performance relationship. It would thus appear that, when the accounting measure was the percentage change in earnings and the stock return measure was market-adjusted returns, outsider-dominated boards considered both the accounting and stock return measures of performance whereas insider-dominated boards focused on the accounting measure of performance.

%EARN and XRET Combination. The results of the regressions for the combination of the %EARN and XRET performance variables are shown in Tables 20 and 21. The regression results for the %EARN model only (Equation (10), PERF = %EARN) and the %EARN model with XRET added (Equation (11), PERF2 = XRET) for the outsider-dominated and insider-dominated subsamples are displayed in Table 20. In Table 21, the regression results are shown for the XRET model only (Equation (10), PERF = XRET) and then for the XRET model with the %EARN performance variable added (Equation (11), PERF2 = %EARN) for each subsample.

The results in Table 20 show that there was significant

Table 20

Regression results for %EARN model with XRET added

Regressor	Outsider-dominated		Insider-dominated	
	%EARN only	XRET added	%EARN only	XRET added
Intercept	0.0633	0.0805	0.0535	0.0557
t-statistic	5.817	7.529	3.110	3.190
%EARN	0.0987	0.0905	0.0722	0.0630
t-statistic	5.898	5.676	1.350	1.148
GRWTH	0.0465	0.0139	0.1464	0.1430
t-statistic	0.532	0.167	1.716	1.672
CEOSTK*%EARN	0.0643	0.0538	0.3429	0.3373
t-statistic	0.926	0.814	4.538	4.438
ENTRCH*%EARN	-0.0341	-0.0408	-0.0098	-0.0062
t-statistic	-0.736	-0.926	-0.155	-0.097
LGFIRM*%EARN	-0.0480	-0.0493	-0.0199	-0.0123
t-statistic	-2.236	-2.417	-0.323	-0.197
LOCK*%EARN	0.0823	0.0560	0.0150	0.0086
t-statistic	2.235	1.592	0.140	0.080
XRET		0.2391		0.0484
t-statistic		6.285		0.764
F-statistic for model	12.019	17.068	8.570	7.412
Adjusted R^2	0.1555	0.2386	0.1963	0.1944
Sample Size	360	360	187	187
Sum of squares error	10.66886	9.59251	7.70279	7.67773
Mean square error		0.02725		0.04289
F^*-statistic[a]		39.4991[b]		0.5843

[a]Calculation: $$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})}$$

[b]Significant at < 0.001 level

additional explanatory power when the excess returns performance variable was added to the %EARN model for the outsider-dominated subsample. The F^*-statistic of 39.4991 was statistically significant at a 0.001 level ($F^*_{0.001(1,\infty)}$ = 10.80). The adjusted R^2 also jumped from 0.1555 to 0.2386. For the insider-dominated subsample, however, the additional explanatory power was not significant when the excess returns variable was added to the %EARN model. The F^*-statistic was an insignificant 0.5843, well below the critical value of 2.71 at a 0.10 level, and the adjusted R^2 decreased slightly from 0.1963 to 0.1944.

When the percentage change in earnings was added to the XRET model in Table 21, the additional explanatory power was significant for both the outsider-dominated and insider-dominated subsamples. The F^*-statistic was 39.3587 for the outsider-dominated subsample and 11.0296 for the insider-dominated subsample, both of which were statistically significant at a 0.001 level ($F^*_{0.001(1,\infty)}$ = 10.80). The adjusted R^2 values showed corresponding increases, from 0.1329 to 0.2179 for the outsider-dominated subsample and from 0.0548 to 0.1047 for the insider-dominated subsample.

These results support Hypothesis 3b, that outsider-dominated and insider-dominated boards differ in the type of performance measure, percentage change in earnings and excess returns, emphasized in the compensation-performance

Table 21

Regression results for XRET model with %EARN added

	Outsider-dominated		Insider-dominated	
Regressor	XRET only	%EARN added	XRET only	%EARN added
Intercept	0.0762	0.0804	0.0526	0.0524
t-statistic	6.723	7.459	2.753	2.819
XRET	0.2699	0.2404	0.1395	0.0651
t-statistic	4.214	3.941	1.274	0.598
GRWTH	0.1300	0.0287	0.2379	0.1738
t-statistic	1.514	0.345	2.636	1.933
CEOSTK*XRET	-0.0283	-0.0298	0.0258	0.2173
t-statistic	-0.160	-0.177	0.115	0.960
ENTRCH*XRET	-0.0875	-0.0982	0.1281	-0.0581
t-statistic	-0.675	-0.799	0.588	-0.265
LGFIRM*XRET	0.0317	0.0151	-0.0625	-0.0272
t-statistic	0.411	0.206	-0.438	-0.196
LOCK*XRET	0.0593	0.0451	-0.1378	-0.1025
t-statistic	0.642	0.514	-0.812	-0.619
%EARN		0.0648		0.0866
t-statistic		6.273		3.321
F-statistic for model	10.170	15.286	2.799	4.109
Adjusted R^2	0.1329	0.2179	0.0548	0.1047
Sample Size	360	360	187	187
Sum of squares error	10.95485	9.85320	9.05807	8.53229
Mean square error		0.02799		0.04767
F^*-statistic[a]		39.3587[b]		11.0296[b]

[a]Calculation: $$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})}$$

[b]Significant at < 0.001 level

relationship. For the outsider-dominated subsample, there was significant additional explanatory power both when the stock return measure, XRET, was added to the accounting (%EARN) model and when the accounting measure, %EARN, was added to the stock return (XRET) model. For the insider-dominated subsample, the additional explanatory power was significant only when the accounting measure, %EARN, was added to the stock return (XRET) model but not when the stock return, XRET, was added to the accounting (%EARN) model. These results imply that, when performance is measured as the percentage change in earnings and excess returns, outsider-dominated boards considered both accounting and stock return measures of performance whereas the insider-dominated boards focused on the accounting measures.

CHGROE and MRET Combination. The regression results for the combination of the CHGROE and MRET performance variables are shown in Tables 22 and 23. In Table 22, the regression results are shown for the CHGROE model only (Equation (10), PERF = CHGROE) followed by the results when the MRET performance variable was added to the CHGROE model (Equation (11), PERF2 = MRET) for the outsider-dominated and insider-dominated subsamples. The results in Table 23 include the regressions for the MRET model only (Equation

(10), PERF = MRET) followed by the regressions for the MRET model with CHGROE added (Equation (11), PERF2 = CHGROE) for each subsample.

The results in Table 22 reveal that adding the market-adjusted returns to the CHGROE model provides significant additional explanatory power for the outsider-dominated subsample but not for the insider-dominated subsample. For the outsider-dominated subsample, the F^*-statistic was 25.5029, which was statistically significant at a 0.001 level ($F^*_{0.001(1,\infty)} = 10.80$). The adjusted R^2 increased correspondingly from 0.1427 to 0.1871. The F^*-statistic for the insider-dominated subsample was 0.5169, which was not statistically significant at a 0.10 level ($F^*_{0.10(1,\infty)} = 2.71$). The adjusted R^2 in this case decreased from 0.1892 to 0.1873.

When the change in earnings weighted by common equity was added to the MRET model, the results show that there was significant additional explanatory power for both the outsider-dominated and insider-dominated subsamples. These results are displayed in Table 23. For the outsider-dominated subsample, the F^*-statistic was 36.0871. The F^*-statistic was 12.4181 for the insider-dominated subsample. Both are statistically significant at a 0.001 level ($F^*_{0.001(1,\infty)} = 10.80$). The adjusted R^2 for each subsample also increased, from 0.1025 to 0.1675 for the outsider-dominated

Table 22

Regression results for CHGROE model with MRET added

Regressor	Outsider-dominated		Insider-dominated	
	CHGROE only	MRET added	CHGROE only	MRET added
Intercept	0.0647	0.0618	0.0485	0.0492
t-statistic	6.346	6.209	2.892	2.923
CHGROE	0.8913	0.7783	0.6236	0.5732
t-statistic	5.047	4.488	1.429	1.295
GRWTH	0.0729	0.1221	0.1831	0.1800
t-statistic	0.929	1.586	2.299	2.255
CEOSTK*CHGROE	0.5102	0.2148	1.6590	1.6160
t-statistic	0.844	0.363	4.021	3.872
ENTRCH*CHGROE	-0.2000	-0.1962	-0.5219	-0.5032
t-statistic	-0.674	-0.678	-1.063	-1.023
LGFIRM*CHGROE	-0.3812	-0.4222	-0.0484	-0.0723
t-statistic	-1.917	-2.178	-0.097	-0.144
LOCK*CHGROE	0.5445	0.5590	-0.1315	-0.1567
t-statistic	2.339	2.466	-0.269	-0.319
MRET		0.1554		0.0414
t-statistic		5.050		0.719
F-statistic for model	13.628	15.961	9.208	7.948
Adjusted R^2	0.1427	0.1871	0.1892	0.1873
Sample Size	456	456	212	212
Sum of squares error	14.69856	13.90695	9.22322	9.19991
Mean square error		0.03104		0.04510
F^*-statistic[a]		25.5029[b]		0.5169

[a]Calculation: $$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})}$$

[b]Significant at < 0.001 level

Table 23

Regression results for MRET model with CHGROE added

Regressor	Outsider-dominated		Insider-dominated	
	MRET only	CHGROE added	MRET only	CHGROE added
Intercept	0.0541	0.0619	0.0482	0.0441
t-statistic	5.164	6.088	2.709	2.536
MRET	0.2325	0.1903	0.1851	0.1083
t-statistic	4.075	3.434	1.619	0.955
GRWTH	0.2399	0.1318	0.2673	0.2217
t-statistic	3.021	1.678	3.251	2.735
CEOSTK*MRET	-0.0186	0.0054	0.1665	0.3288
t-statistic	-0.150	0.045	0.865	1.705
ENTRCH*MRET	-0.0397	-0.0486	-0.0926	-0.2660
t-statistic	-0.350	-0.446	-0.457	-1.309
LGFIRM*MRET	-0.0158	-0.0499	-0.1069	-0.1523
t-statistic	-0.236	-0.771	-0.783	-1.141
LOCK*MRET	0.0183	0.0324	-0.0632	-0.0542
t-statistic	0.217	0.399	-0.486	-0.428
CHGROE		0.5526		0.6818
t-statistic		6.007		3.524
F-statistic for model	9.660	14.082	4.666	5.996
Adjusted R^2	0.1025	0.1675	0.0944	0.1422
Sample Size	456	456	212	212
Sum of squares error	15.38876	14.24155	10.30217	9.71107
Mean square error		0.03179		0.04760
F^*-statistic[a]		36.0871[b]		12.4181[b]

[a]Calculation: $$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})}$$

[b]Significant at < 0.001 level

subsample and from 0.0944 to 0.1422 for the insider-dominated subsample.

These results indicate that both the change in earnings weighted by common equity and market-adjusted returns provide additional explanatory power in the presence of the other variable for the outsider-dominated subsample whereas only the change in earnings weighted by common equity provided additional explanatory power in the presence of the market-adjusted returns for the insider-dominated subsample. No significant additional explanatory power was provided by adding the market-adjusted returns in the presence of the change in earnings weighted by common equity for the insider-dominated subsample. These results support Hypothesis 3c, that outsider-dominated and insider-dominated boards differ in the type of performance measure emphasized in the compensation-performance relationship. These results imply that, when performance is measured as the change in earnings weighted by common equity and market-adjusted returns, outsider-dominated boards considered both accounting and stock return measures of performance whereas the insider-dominated boards focused on the accounting measures.

CHGROE and XRET Combination. Shown in Tables 24 and 25 are the regression results for the combination of the CHGROE

and XRET performance variables. The regression results for the CHGROE model only (Equation (10), PERF = CHGROE) followed by the CHGROE model with XRET added (Equation (11), PERF2 = XRET) for each subsample are displayed in Table 24. Table 25 provides the results of the regressions for the XRET model only (Equation (10), PERF = XRET) and the XRET model with the CHGROE performance variable added (Equation (11), PERF2 = CHGROE) for each subsample.

The results displayed in Table 24 reveal that adding excess returns to the regression model containing the change in earnings weighted by common equity provides significant additional explanatory power for the outsider-dominated subsample but not for the insider-dominated subsample. The F^*-statistic was 35.2795 for the outsider-dominated subsample, which was statistically significant at a 0.001 level ($F^*_{0.001(1,\infty)} = 10.80$). The adjusted R^2 showed a corresponding increase from 0.1478 to 0.2213. For the insider-dominated subsample, the F^*-statistic of 0.4878 was insignificant at a 0.10 level ($F^*_{0.10(1,\infty)} = 2.71$) and the adjusted R^2 declined from 0.1716 to 0.1693.

The results in Table 25 reveal that adding the change in earnings weighted by common equity to the excess returns model provided significant additional explanatory power for both the outsider-dominated and insider-dominated subsamples. The F^*-statistic was 25.7720 for the outsider-

Table 24

Regression results for CHGROE model with XRET added

	Outsider-dominated		Insider-dominated	
Regressor	CHGROE only	XRET added	CHGROE only	XRET added
Intercept	0.0616	0.0782	0.0434	0.0465
t-statistic	5.750	7.373	2.497	2.589
CHGROE	1.0906	0.9473	0.8282	0.7476
t-statistic	5.654	5.094	1.827	1.596
GRWTH	0.0643	0.0416	0.2053	0.2003
t-statistic	0.740	0.500	2.432	2.360
CEOSTK*CHGROE	0.3826	0.0516	2.1723	2.1555
t-statistic	0.546	0.077	4.436	4.390
ENTRCH*CHGROE	-0.4252	-0.2938	-0.7305	-0.6973
t-statistic	-1.238	-0.893	-1.439	-1.365
LGFIRM*CHGROE	-0.6272	-0.6619	-0.2707	-0.2420
t-statistic	-2.936	-3.240	-0.525	-0.468
LOCK*CHGROE	0.3701	0.3246	-0.2772	-0.2969
t-statistic	1.555	1.426	-0.429	-0.459
XRET		0.2286		0.0465
t-statistic		5.940		0.699
F-statistic for model	11.668	15.985	7.595	6.562
Adjusted R^2	0.1478	0.2213	0.1716	0.1693
Sample Size	370	370	192	192
Sum of squares error	11.11639	10.12927	8.27451	8.25263
Mean square error		0.02798		0.04485
F^*-statistic[a]		35.2795[b]		0.4878

[a]Calculation: $$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})}$$

[b]Significant at < 0.001 level

Table 25

Regression results for XRET model with CHGROE added

	Outsider-dominated		Insider-dominated	
Regressor	XRET only	CHGROE added	XRET only	CHGROE added
Intercept	0.0765	0.0779	0.0578	0.0464
t-statistic	6.857	7.221	3.045	2.437
XRET	0.2727	0.2388	0.1399	0.0602
t-statistic	4.277	3.849	1.287	0.546
GRWTH	0.1366	0.0581	0.2426	0.2300
t-statistic	1.606	0.693	2.685	2.591
CEOSTK*XRET	-0.0259	-0.0394	-0.0225	0.2098
t-statistic	-0.146	-0.229	-0.101	0.897
ENTRCH*XRET	-0.0964	-0.0693	0.1514	-0.0684
t-statistic	-0.734	-0.545	0.694	-0.301
LGFIRM*XRET	0.0254	-0.0225	-0.0507	-0.0681
t-statistic	0.338	-0.307	-0.365	-0.499
LOCK*XRET	0.0733	0.0671	-0.1317	-0.0998
t-statistic	0.805	0.761	-0.774	-0.596
CHGROE		0.4829		0.6125
t-statistic		5.077		2.862
F-statistic for model	11.090	13.836	2.866	3.722
Adjusted R^2	0.1409	0.1958	0.0554	0.0907
Sample Size	370	370	192	192
Sum of squares error	11.20613	10.46132	9.43586	9.03379
Mean square error		0.02890		0.04910
F^*-statistic[a]		25.7720[b]		8.1888[c]

[a]Calculation: $$F^* = \frac{SSE_{reduced} - SSE_{full}}{(\Delta df)(MSE_{full})}$$

[b]Significant at < 0.001 level

[c]Significant at < 0.01 level

dominated subsample, which was statistically significant at a 0.001 level ($F^*_{0.001(1,\infty)} = 10.80$). For the insider-dominated subsample, the F^*-statistic was 8.1888, which was statistically significant at a 0.01 level ($F^*_{0.01(1,\infty)} = 6.63$). The adjusted R^2 showed corresponding increases for each subsample, from 0.1409 to 0.1958 for the outsider-dominated subsample and from 0.0554 to 0.0907 for the insider-dominated subsample.

These results provide support for Hypothesis 3d, that outsider-dominated and insider-dominated boards differ in the type of performance measure, change in earnings weighted by common equity and excess returns, emphasized in the compensation-performance relationship. There was significant additional explanatory power for the outsider-dominated subsample both when the change in earnings weighted by common equity was added to the XRET model and when the excess return variable was added to the CHGROE model. For the insider-dominated subsample, however, only adding the change in earnings weighted by common equity to the XRET model provided significant additional explanatory power. There was no significant additional explanatory power when excess returns were added to the CHGROE model. These results indicate that, when performance is measured as the change in earnings weighted by common equity and excess returns, outsider-dominated boards appear to consider both

accounting and stock return measures of performance whereas insider-dominated boards appear to focus on accounting measures.

Summary of Hypothesis 3 Testing. In each combination of performance variables described above, the additional explanatory power was significant for the outsider-dominated subsample both when the stock return performance measure was added to the accounting model and when the accounting performance measure was added to the stock return model. For the insider-dominated subsample, the additional explanatory power was significant only when the accounting performance measure was added to the stock return model but not when the stock return performance measure was added to the accounting model. These results were consistent for every combination of accounting and stock return performance measures.

Hypothesis 3 is thus supported by these results. Outsider-dominated and insider-dominated boards do appear to differ in the type of performance measure, accounting and stock return, emphasized in the relationship between the change in CEO compensation and firm performance. These results imply that both accounting and stock return performance measures were considered by outsider-dominated boards whereas insider-dominated boards focused on

accounting measures.

The conclusions drawn from the analyses of these data, along with the limitations and implications for future research, are presented in the next chapter.

CHAPTER 6

CONCLUSIONS, LIMITATIONS, AND IMPLICATIONS FOR FUTURE RESEARCH

Summary and Conclusions

Agency problems between managers and shareholders occur because of the separation of stock ownership and decision control in corporations [Jensen and Meckling (1976), Fama (1980)]. To reduce these agency costs, monitoring and incentives are used to align managers' interests with those of shareholders [Jensen and Meckling (1976)]. It is generally accepted that the board of directors of the corporation has primary responsibility for this monitoring function as well as hiring and firing the top executive, and evaluating and rewarding top management performance [Fama and Jensen (1983)].

Boards have been criticized for not performing these roles effectively. Critics have suggested increasing the

proportion of outside directors on the board as a means of improving the effectiveness of the board [e.g., Rechner (1989), Mace (1986)]. Empirical studies have provided evidence that the composition of the board has an effect on firm performance [e.g., Baysinger and Butler (1985)], the likelihood of CEO turnover [Weisbach (1988)], and the market's reaction to the adoption of poison pills [e.g., Brickley, Coles, and Terry (1994)] and acquisitions [e.g., Byrd and Hickman (1992)]. In general, these studies support critics' claims of improved board effectiveness when the board is composed of a higher proportion of outside directors.

Virtually all of the generally accepted functions of the board have been explored in the board composition literature except for the role of evaluating and rewarding the top executive. The evaluation and reward of top executives is most often accomplished through compensation plans, which are designed to reward managers based on performance. While Mangel and Singh (1993) and Mallette, Middlemist, and Hopkins (1995) failed to find a relationship between board composition and the level of CEO pay, they did not consider the effect of board composition on the pay-performance relationship. A significant relationship between executive compensation and firm performance has been established in the extensive pay-performance literature, but

again, the effect of board composition on this relationship has not been considered. The purpose of this study, then, was to investigate the effect of board composition on the relationship between executive compensation and firm performance. In addition, the effect of board composition on the type of performance measures used, accounting or stock return measures, was also investigated.

Before examining the research questions of this study, it was deemed prudent to first establish that there is a relationship between compensation and performance when the board is dominated by outside directors. The results of the analyses in Chapter 5 reveal that there is a significant positive relationship between the change in CEO salary and bonus compensation and firm performance when the board is dominated by outside directors. The results were significantly positive for each of the four performance measures. The performance measures included two accounting measures, percentage change in earnings and change in earnings weighted by common equity, and two stock return measures, market-adjusted returns and excess returns. These results are consistent with the findings of prior research in the pay-performance literature [e.g., Lambert and Larcker (1987), Gibbons and Murphy (1990), and Kerr and Kren (1992)].

The first research question dealt with the effect of

the composition of the board on the pay-performance relationship. It was hypothesized that there would be a stronger association between CEO compensation and firm performance when the board is dominated by outside directors. The results of the analyses in Chapter 5 were mixed. The association between pay and performance for outsider-dominated boards was significantly stronger only when the performance measure was excess returns, although some weak evidence was found when the performance measure was market-adjusted returns. No evidence was found of a stronger association between pay and performance for outsider-dominated boards for either of the accounting measures of performance, percentage change in earnings or change in earnings weighted by common equity.

The mixed results from the analyses of the effect of board composition on the pay-performance relationship do not allow an unequivocal conclusion that outsider-dominated boards are more effective than insiders in linking compensation with performance. The finding of a significantly stronger association between compensation and stock return measures of performance could imply that outside directors are more effective than insiders in linking compensation with performance. However, the lack of a significantly stronger association for accounting measures could imply that outside and inside directors are equally

effective in linking compensation with performance. The results of the analyses on the type of performance measures used, discussed in the next few paragraphs, shed additional light on these findings.

With regard to the second research question, it was hypothesized that boards dominated by outside directors would differ from insider-dominated boards in the type of performance measures, accounting or stock return, used in the pay-performance relationship. The results of the analyses in Chapter 5 provided conclusive evidence in support of this hypothesis. For the outsider-dominated subsample, adding the stock return measure of performance to the accounting model and adding the accounting measure to the stock return model both resulted in significant additional explanatory power. In contrast, the additional explanatory power was significant for the insider-dominated subsample only when the accounting performance measure was added to the stock return model but not when the stock return performance measure was added to the accounting model. The same results were obtained for every combination of accounting and stock return measures of performance. These results indicate that both accounting and stock return performance measures are considered by outsider-dominated boards whereas insider-dominated boards tend to focus on the accounting measures of performance in the pay-performance

relationship.

The results of the analyses on the type of performance measures provide an explanation for the earlier mixed results regarding the effect of board composition on the pay-performance relationship. The finding of significant additional explanatory power when accounting measures are added to the stock return model reveal that both outsider and insider-dominated boards use accounting measures of performance. The lack of a significantly stronger association between compensation and accounting measures of performance for outsider-dominated boards implies that there is little difference between outsiders and insiders in linking compensation to accounting measures of performance. The results of the analyses on the types of performance measures also reveal that outsider-dominated boards consider stock return measures in addition to accounting measures whereas insider-dominated boards do not. This would explain the finding of a stronger association between compensation and stock return measures of performance when the board is dominated by outside directors.

Taken together, these results provide evidence that the composition of the board of directors has an effect on the relationship between CEO compensation and firm performance and the types of performance measures used. These findings imply that boards dominated by independent outside directors

tend to represent the interests of shareholders, who are interested in maximizing firm equity value, by linking CEO cash compensation with stock return measures as well as accounting measures of performance. These findings are consistent with findings of other board composition studies that outside directors represent the interests of shareholders [e.g., Weisbach (1988), Byrd and Hickman (1992), Brickley, Coles, and Terry (1994)]. In addition, the finding that outsiders consider both stock return and accounting measures of performance in the pay-performance relationship whereas insiders focus on accounting measures is consistent with the explanation by Sloan (1993) that executives prefer accounting measures of performance because they have more control over elements underlying the accounting measures than stock returns.

Overall, this study adds to the growing body of literature on corporate governance issues and provides further evidence that outside directors play an important role in the corporate governance process. In addition, this study provides a bridge between the corporate governance literature and the pay-performance literature by demonstrating that the composition of the board of directors is an important factor to consider in the relationship between compensation and performance.

Limitations

There are several limitations inherent in this study. First, a random sample of firms was drawn from the compensation surveys published by Forbes. These firms are listed on the New York, American, and NASDAQ stock exchanges and tend to be relatively large. The use of a sample of large firms may mean that the results may not be generalizable to smaller firms. Also, using a random sample rather than the entire population carries with it a slight risk that the sample may not be representative of the population.

While much care was taken in the assembly of the data for this study, the classification of outside directors into affiliated or independent categories may be inherently problematic. Nonemployee directors with family relationships or potential financial conflicts of interest could be readily identified from the proxy statements and categorized as affiliated directors. Nonemployee directors with personal ties to the chief executive could not be readily identified. Although directors are presumably elected by the shareholders, the chief executive is usually instrumental in the director selection process [Patton and Baker (1987), Mace (1986)]. As a result, outside directors with no apparent ties to the firm may still have potential

conflicts of interest due to their personal friendships or social ties to the chief executive. These affiliations would be difficult if not impossible to identify, and no attempt was made to do so. The net effect of failing to identify socially affiliated directors, however, would be to overstate the percentage of independent directors and bias against finding significant results.

A third limitation in this study is the exclusion of changes in the value of CEO stockholdings and stock options from the definition of compensation. Lambert and Larcker (1985) argue that excluding stock-based incentives from the definition of compensation may understate the variability of CEO compensation, weakening the pay-performance relationship. That is, when the CEO holds stock and stock options in the firm, a decline in the firm's market value due to poor performance may penalize the CEO through the loss in value of the CEO's stockholdings. The board may consider this a sufficient penalty and see no need to decrease the CEO's bonus or salary. Jensen and Murphy (1990) suggest, however, that this understatement in variability is minor. Also, stock options have been criticized for having no down-side risk, particularly when firms may revise the CEO's stock option plan if the stock price drops below the exercise price [Fierman (1990), Crystal (1991a)]. In addition, Kerr and Kren (1992)

conclude that stock options may not be a reward for past performance but rather an incentive for future performance. While good reasons were presented for excluding stock-based incentives from this study, they remain an important component of executive compensation that could play a role in the complex process of evaluating and rewarding top management.

Implications for Future Research

In several prior studies, the compensation-performance relationship was found to be stronger for accounting measures than for stock return measures of performance [e.g., Antle and Smith (1986), Lambert and Larcker (1987), Janakiraman, Lambert, and Larcker (1992)]. These studies did not, however, consider the composition of the board of directors. In this study, outsider-dominated boards were found to differ from insider-dominated boards in their use of accounting and stock return measures of performance in the pay-performance relationship. More specifically, outsider-dominated boards use both accounting and stock return measures of performance in the pay-performance relationship whereas insider-dominated boards tend to focus on accounting measures. By not considering the composition of the board, it is possible that the findings of these

previous studies could be driven, at least in part, by the strength of the relationship between compensation and accounting measures for insider-dominated boards. An interesting extension of their work, and this study, would be to compare the strength of the compensation-performance relationships for accounting and stock return measures for outsider-dominated boards. The prior studies used time series over a twenty-year period, however, which could prove problematic for the availability of board composition data.

In other prior research, Healy (1985) found evidence that managers increase or decrease accruals in order to maximize their bonuses. Another avenue of research would be to investigate whether the composition of the board affects the ability of executives to manipulate accruals.

This study provides evidence, consistent with other board composition studies, that independent outside directors perform an important role in corporate governance. Valid reasons were given previously for the inclusion of inside directors on the board as well [e.g., Fama (1980), Fama and Jensen (1983)]. The question of whether there is an optimal combination of outside and inside directors on the board, as Baysinger and Butler (1985) have suggested, remains unanswered. Should the board consist entirely of outsiders except for the chief executive, as Mace (1986) has suggested, or be composed of some optimal combination? This

is also a question for future research.

This study provides further insight into the process of corporate governance and the complex relationship between executive compensation and firm performance. Certainly, further research into the process of corporate governance and executive remuneration is necessary before it can be fully understood.

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APPENDIX A

SAMPLE FIRMS

Abbott Laboratories
Aetna Life & Casualty
Albertson's
Allied Signal
Alltel
American Brands
American Cyanamid
American Electric
American Home Products
American Stores
Ameritech
AMP
Amoco
AmSouth Bancorp
Aon
Archer-Daniels
Argonaut Group
Arkla
Atlantic Richfield
Automatic Data
Avon Products
Baker-Hughes
Ball Corp.
Baltimore Bancorp
Bancorp Hawaii
Bank of New York
Bank South
BanPonce
CR Bard
Barnett Banks
Bausch & Lomb
BayBanks
Bear Stearns

Bell Atlantic
BellSouth
Beverly Enterprises
Black & Decker
Boeing
Borden
Boston Edison
Bowater
Brown Group
Browning-Ferris Industries
Brunswick
Burlington Northern
CMS Energy
CSX
Caterpillar
Central Bancshares
Champion International
Circus Circus
City National
Coast Savings Financial
Colorado National Bankshares
Columbia Gas System
Comerica
ConAgra
Consolidated Edison
Control Data (Ceridian as of 1992)
Cooper Industries
Crestar Financial
Dana
Dayton Hudson
Delmarva Power & Light
Delta Air Lines
Deluxe
Diamond Shamrock
Digital Equipment
Dillard Department Stores
Dominion Resources
Downey Savings & Loan
Dreyfus
Dun & Bradstreet
E-Systems
Eastman Kodak
Engelhard
Equimark
Ethyl
FMC
First Bancorp Ohio
First Chicago
First Citizens Bancshares

First Commerce
First Empire State
First of America Bank
First Tennessee National
First Union
Fleming Companies
Ford Motor
Gap
Geico
Genentech
General Cinema
General Electric
General Mills
Genuine Parts
Georgia-Pacific
Gillette
GlenFed
BF Goodrich
Goodyear
WW Grainger
Great Western Financial
Grumman
Gulf States Utilities
Halliburton
Harris Corp
Hasbro
HJ Heinz
Household International
Illinois Power
Illinois Tool
Ipalco Enterprises
Jefferson-Pilot
Johnson Controls
Kemper
Kerr-McGee
Knight-Ridder
Litton Industries
Lockheed
Longs Drug Stores
Loral
MBIA
Manufacturers National
Masco
McDonald's
Mellon Bank
Mercantile Stores
Merchants National
Merck
Michigan National

Minnesota Mining & Manufacturing
Minnesota Power
Morgan Stanley
Morrison Knudson
NBD Bancorp
National City
National Semiconductor
National Service
New England Electric
New York State Electric & Gas
Norfolk Southern
Northeast Bancorp
Norwest
Nucor
Ohio Casualty
Oklahoma Gas & Electric
Old Kent Financial
Oracle Systems
PPG Industries
Pacific Gas & Electric
PacifiCorp
PaineWebber Group
Phillips Petroleum
Polariod
Price Co
Primerica
Provident Life
Puget Sound Power & Light
Republic New York
Roadway Services
Rubbermaid
Ryder System
St. Paul Companies
San Diego Gas & Electric
Sara Lee
Sears Roebuck
Sherwin-Williams
Signet Banking
Snap-On Tools
Southern Company
Southern New England Telecom
Southwest Gas
Springs Industries
State Street Boston
Sun Microsystems
Sundstrand
SunTrust Banks
Super Food Services
TECO Energy

Tambrands
Tandem Computers
Texas Utilities
Times Mirror
Timken
Tribune
USF&G
UST Inc
Union Camp
Union Planters
Universal
Unocal
Upjohn
Valley National
Washington Post
Washington Water
Winn-Dixie Stores
Woolworth
Wm. Wrigley
Xerox

APPENDIX B

SUPPLEMENTARY TABLES

Table B1

Pearson Correlation Coefficients: Performance = %EARN

	%EARN	OD*PERF	GRWTH	CEOSTK *PERF	ENTRCH *PERF	LGFIRM *PERF	LOCK *PERF	LGSH *PERF
%EARN	1.00000	0.87128	0.18598	0.37321	0.44842	0.75398	0.33024	0.88595
OD *PERF		1.00000	0.08527	0.21497	0.26159	0.69352	0.33861	0.75503
GRWTH			1.00000	0.09549	0.15606	0.09731	0.05355	0.09632
CEOSTK *PERF				1.00000	0.55446	0.27515	0.37604	0.32347
ENTRCH *PERF					1.00000	0.22604	0.35063	0.41392
LGFIRM *PERF						1.00000	0.32703	0.61444
LOCK *PERF							1.00000	0.14317
LGSH *PERF								1.00000

Table B2

Pearson Correlation Coefficients: Performance = CHGROE

	CHGROE	OD*PERF	GRWTH	CEOSTK *PERF	ENTRCH *PERF	LGFIRM *PERF	LOCK *PERF	LGSH *PERF
CHGROE	1.00000	0.88718	0.14729	0.26188	0.70284	0.54873	0.29626	0.90186
OD *PERF		1.00000	0.06855	0.08612	0.65932	0.51439	0.26270	0.80764
GRWTH			1.00000	0.14679	0.08084	0.08180	0.06572	0.06972
CEOSTK *PERF				1.00000	0.29210	0.19798	0.38626	0.13173
ENTRCH *PERF					1.00000	0.09738	0.17169	0.71877
LGFIRM *PERF						1.00000	0.36529	0.36045
LOCK *PERF							1.00000	0.08348
LGSH *PERF								1.00000

Table B3

Pearson Correlation Coefficients: Performance = MRET

	MRET	OD*PERF	GRWTH	CEOSTK *PERF	ENTRCH *PERF	LGFIRM *PERF	LOCK *PERF	LGSH *PERF
MRET	1.0000	0.8036	0.0463	0.5329	0.5362	0.7525	0.4486	0.7766
OD *PERF		1.0000	-0.0359	0.2412	0.3128	0.7002	0.3365	0.6335
GRWTH			1.0000	0.0635	0.0914	-0.0574	0.0662	-0.0029
CEOSTK *PERF				1.0000	0.8073	0.2264	0.4325	0.3146
ENTRCH *PERF					1.0000	0.1911	0.4908	0.2994
LGFIRM *PERF						1.0000	0.3082	0.6069
LOCK *PERF							1.0000	0.1362
LGSH *PERF								1.0000

Table B4

Pearson Correlation Coefficients: Performance = XRET

	XRET	OD*PERF	GRWTH	CEOSTK *PERF	ENTRCH *PERF	LGFIRM *PERF	LOCK *PERF	LGSH *PERF
XRET	1.00000	0.78662	0.12898	0.39532	0.44343	0.71077	0.43609	0.72716
OD *PERF		1.00000	0.08119	0.12321	0.19845	0.64531	0.37907	0.55085
GRWTH			1.00000	0.02578	0.08136	0.05430	0.06528	0.11913
CEOSTK *PERF				1.00000	0.70396	0.17737	0.23261	0.26066
ENTRCH *PERF					1.00000	0.15473	0.28829	0.31673
LGFIRM *PERF						1.00000	0.30875	0.44956
LOCK *PERF							1.00000	0.14970
LGSH *PERF								1.00000

TABLE B5

Regression results prior to influence diagnostics.

Variable	PERF = %EARN	PERF = CHGROE	PERF = MRET	PERF = XRET
Intercept	0.0549	0.0562	0.0499	0.0686
t-statistic	6.177	6.367	5.493	6.853
p-value	<0.0001	<0.0001	<0.0001	<0.0001
PERF	0.1406	0.3794	0.1871	0.1591
t-statistic	5.943	2.697	2.867	2.167
p-value	<0.0001	0.0036	0.0022	0.0154
OD*PERF	-0.0657	-0.1101	0.0266	0.1146
t-statistic	-2.902	-0.757	0.435	1.534
p-value	0.0019	0.2247	0.3319	0.0629
GRWTH	0.1506	0.1733	0.2665	0.2086
t-statistic	2.775	3.205	4.847	3.428
p-value	0.0029	0.0007	<0.0001	0.0004
CEOSTK*PERF	0.1567	1.5435	0.2848	0.2309
t-statistic	5.236	6.142	3.131	1.841
p-value	<0.0001	<0.0001	0.0018	0.0662
ENTRCH*PERF	-0.0742	-0.3303	-0.2196	-0.1121
t-statistic	-2.802	-2.542	-2.402	-1.0002
p-value	0.0026	0.0056	0.0083	0.1584
LGFIRM*PERF	-0.2843	0.2770	0.0142	0.0299
t-statistic	-1.534	1.959	0.239	0.430
p-value	0.1255	0.0253	0.4055	0.3337
LOCK*PERF	0.0418	0.1683	-0.0307	-0.0199
t-statistic	1.339	0.808	-0.435	-0.234
p-value	0.0905	0.4194	0.6638	0.8152
F-statistic	23.526	20.614	15.381	11.343
p-value	<0.0001	<0.0001	<0.0001	<0.0001
Adjusted R^2	0.1945	0.1694	0.1301	0.1132
Sample Size	654	674	674	568

APPENDIX C

USE OF INDICATOR VARIABLES IN REGRESSION

The methodology described in Chapter 4 and applied in Chapter 5 involves the use of a qualitative (indicator) variable in the regression model for outsider-dominated versus insider-dominated observations. A brief explanation is given in this appendix of the use of the indicator variable and the interpretation of the coefficients.

As discussed in Neter et al. (1990, pp. 349-360), the use of a single regression with an indicator variable rather than fitting a separate regression to each subsample offers several advantages. One advantage is that one regression will yield both response functions, as will be illustrated below. Another advantage is that more degrees of freedom will be associated with the mean square error when fitting one regression with an indicator variable. The third advantage is that a comparison of the regression functions for different classes of the indicator variable (e.g.,

outsider-dominated vs. insider-dominated) becomes a test of regression coefficients in a general linear model. This will also be illustrated below in the test for whether the two regression functions have the same slope.

To illustrate, the regression model from Equation (6) in Chapter 4 is partially reproduced below. For simplicity, the model is shown with only the outsider/insider indicator variable and without the control variables.[52]

$$CHGPAY = \beta_0 + \beta_1 PERF + \beta_2 OD*PERF \quad (13)$$

where

CHGPAY = $Ln\{(Salary_t+Bonus_t)/(Salary_{t-1}+Bonus_{t-1})\}$

PERF = The performance variable, either %EARN, CHGROE, MRET, or XRET as defined in Chapter 4

OD = Dichotomous variable equal to 1 if the percentage of independent outside directors is greater than 50%, 0 otherwise

For the insider-dominated subsample, OD = 0 and the regression function becomes:

$$CHGPAY = \beta_0 + \beta_1 PERF + \beta_2(0)*PERF$$

$$= \beta_0 + \beta_1 PERF$$

For the outsider-dominated subsample, OD = 1 and the regression function is:

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[52]As discussed in the "Intercept" subsection of the "Tests of Hypotheses" section of Chapter 5, the intercept was found to be the same for all subsamples represented by indicator variables. Had this not been the case, the model would include another constant as follows:

$$CHGPAY = \beta_0 + \beta_1 OD + \beta_2 PERF + \beta_3 OD*PERF$$

$$\text{CHGPAY} = \beta_0 + \beta_1 \text{PERF} + \beta_2(1)*\text{PERF}$$

$$= \beta_0 + (\beta_1 + \beta_2)\text{PERF}$$

From these functions, it can be seen that β_1 is the slope for the insider-dominated function and $(\beta_1 + \beta_2)$ is the slope for the outsider-dominated function. Thus, β_2 is a measure of the difference in the slope for the outsider-dominated subsample as compared to the insider-dominated subsample, which is the test for Hypothesis 2 in Chapter 5.

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VITA

Dee Ann Hetland Ellingson was born on December 11, 1956, and grew up in rural North Dakota. She graduated summa cum laude from Minot State University in 1979 with a Bachelor of Arts degree in mathematics and business administration. In 1981, she received her Certified Public Accountant certificate and graduated with a Master of Accountancy degree from the University of North Dakota. Her professional experience includes three years in public accounting with Deloitte Haskins & Sells in Minneapolis, MN, four years as an assistant professor of accounting at Moorhead State University in Moorhead, MN, and two years as accounting manager at St. Ansgar's Hospital in Park River, ND. Since 1993, she has been an assistant professor of accounting at the University of North Dakota.