CEO COMPENSATION AND SUBSEQUENT FIRM PERFORMANCE: AN EMPIRICAL INVESTIGATION

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Abstract

This study develops and uses a two-stage model to examine the correlation between the compensation of 137 CEO's and the subsequent performance of the 56 companies they manage. This study tests both relationships suggested by the analytical compensation literature and several common assumptions made in the empirical compensation literature. The results suggest that the form of CEO compensation and the relative importance of personal stock ownership both have an effect on subsequent firm performance. Greater reliance on stock options, as a form of CEO compensation, is positively correlated with superior subsequent firm performance, while greater reliance on annual bonuses appears to have the opposite effect. The results also suggest that greater personal stock ownership may not provide the commonly assumed alignment of interest between CEO and stockholder.

Keywords: compensation, CEO, stockholder, stock option

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1. Introduction

The primary purpose of this study is to further our understanding of the relationship between executive compensation and long-term firm performance. Porter (1992) documents a widely held perception by business leaders, policy makers, and academics that a "short time horizon" negatively affects the ability of U.S. industry to compete internationally. Milkovich and Rabin (1991) make a strong argument in favor of examining "tomorrow's performance" when assessing the effects of executive incentives. The current research design addresses the horizon issue raised by Porter in a manner consistent with the arguments made by Milkovich and Rabin. This study examines the effects of both short-term and long-term incentives on subsequent firm performance, one, three, and five years after the year of compensation. The analytical compensation literature has given us a rich understanding of the incentive effects and implications of various components in executive compensation. The empirical literature has shown us that executive compensation contracts contain components commonly believed to provide short-term and long-term incentives. The current study tests both suggestions made in the analytical literature and common assumptions made in the empirical literature in a manner that adds to our understanding of the firm performance effects of short-term and long-term incentives. The empirical tests are conducted by examining the ex post (subsequent) stock performance relative to year and industry, one, three, and five years after the year of CEO compensation. This study specifically examines the correlations between subsequent firm performance and: (1) the relative amount of compensation; (2) various forms of compensation; and, (3) the relative importance of personal stock ownership. The empirical findings are consistent with the assumption that annual bonuses provide effective short-term incentives. However, the findings also suggest that greater reliance on annual bonuses may have a negative effect on long-term firm performance. The findings are consistent with the assumption that stock options provide effective long-term incentives. The empirical findings also suggest that the effects of risk-aversion may outweigh the positive incentive effects of personal stock holdings by CEOs with regards to long-term firm performance. Although this study finds that large personal stock holdings are positively correlated with contemporaneous firm performance, the opposite is found for long-term firm performance. This finding is inconsistent with the common assumption that personal ownership aligns the interests of CEO and

shareholders' long-tern interests. This study finds no correlation between the relative amount of compensation and subsequent firm performance.

The analytical (agency-theory) literature has contributed greatly to our understanding of incentives.[1] Jensen and Meckling (1976) demonstrate that incentive contracts should reduce agency cost. Holmstrom (1979) demonstrates that imperfect information can improve on contracts based on outcomes alone. Fama (1980) shows that in a multi-period contract the agent must consider future wages that will depend on the results of the agent's current actions and/or effort. Lambert (1983) extends the theory of agency by showing that in multi-period situations, the commitment of firm and executive to long-term contracts can reduce agency cost.

Diamond and Verrecchia (1982, 275) state, "Since decision makers within a firm are not sole owners of the business, but employed agents, the decisions which they make depend on the incentives which the organization provides." Fundenberg et al. (1990) find that long-term contracts are only optimal if contracting requires commitment today to something that would not have been adopted later. Jackson and Lazear (1991) demonstrate that since executive stock options make executives long in calls, the incentive effect should make executives more willing to accept riskier projects. Scholes (1991, 803) states "These arrangements [stock compensation plans] are put in place for incentive reasons, to align the interests of employees more closely with those of shareholders." Scholes goes on to explain that the positive and desirable incentive effects may be countered by employees bearing additional risk. The focus of more recent analytical studies has been to explain the predominate use of accounting returns in compensation contracts. Paul (1992) and Lambert (1993) agree that if the purpose of compensation were to align the interests of executive and shareholder, it would seem most reasonable to compensate solely based on stock price. Paul (1992) defends the widely observed use of accounting returns by demonstrating that stock returns expose executives to the risk of industry-wide and economy-wide shocks. Lambert (1993) also defends the use of accounting returns as a means of shielding executives from uncontrollable factors that affect stock price. Banker and Datar (1989) serves as a foundation for several subsequent studies examining executive compensation issues (Bushman and Indejikian, 1993; Kim and Suh, 1993; Lambert, 1993). Banker and Datar (1989) find that the weight placed on a given signal in a compensation contract should be increasing in sensitivity and precision, when sensitivity is the co-variation between the signal and changes in the agent's effort, and where precision is defined as the lack of noise. Bushman and Indejikian (1993) apply Banker and Datar's sensitivity and precision argument to the uses of accounting and stock returns in executive compensation contracts. Bushman and Indejikian note that managers must allocate effort over a variety of activities including new product development, diversification, and cost control; and further note that the firm must provide incentives for each of these activities. Bushman and Indejikian argue that in providing these incentives, both accounting returns and stock returns may measure output, and that accounting returns will be more important as the sensitivity and precision of accounting returns increases. Kim and Suh (1993) find that the information value of stock price is only the incremental information value, after considering earnings.

Lambert et al. (1991) emphasize that the value of compensation may be quite different when viewed from the manager's or shareholders' point of view. Lambert et al. make the point that no component of compensation can be valued without consideration of all the other components. Bizjak et al. (1993) observe that while all future cash flows arising from investment decisions will ultimately be known and observable, that this may not occur for some period of years. Bizjak et al. argue that under asymmetric information an "over-emphasis" of compensation based on near-term stock returns may lead managers to attempt to manipulate current stock prices through less-than-optimal, but observable, investment choices. The empirical executive compensation literature commonly draws on this analytical literature in establishing testable hypotheses (e.g., Coughlan and Schmidt, 1985; Kerr and Bettis, 1987; Lambert and Larcker 1987; Hill and Phan, 1991). Coughlan and Schmidt (1985, 46) state, "[T]he effects of good management will ultimately be reflected in the stock price." They find that changes in CEO compensation are significantly correlated with abnormal stock returns and conclude that executive compensation plans help reduce agency cost, i.e., "... tend to align the incentives of top management with those of the firm's shareholders" (66). Kerr and Bettis (1987) fail to find similar significant correlations between changes in compensation (salary and bonus) and abnormal stock returns. Kerr and Bettis conclude that either compensation contracts are not designed to reduce agency cost, or that compensation committees are relying on alternative measures of firm performance as a means of aligning the interests of CEOs and shareholders. Lambert and Larcker (1987) refine the agency model to demonstrate that the informational properties of accounting earnings, vs. the informational properties of stock returns, will determine their relative importance in executive compensation contracts. Lambert and Larcker find a much stronger empirical relationship between accounting returns and executive compensation than they find between stock returns and executive compensation. They argue this is a rational outcome. "[A]lthough the principal's utility is a direct function of the firm's

[1] For a more complete review of the analytical and empirical executive compensation literature, see Pavlik et al. (1993).

stock price...., agency theory does not imply that the optimal contract simply ties the agent's compensation exclusively to the firm's stock price" (88).

While some empirical compensation studies allude to the potential effects of risk- aversion, most of the empirical studies only examine the incentive side of the agency problem. There is an underlying assumption in most of the empirical literature that positive correlation between pay and performance serves as an indicator that executive compensation packages are structured to reduce agency cost. Murphy (1985) finds a strong link between executive compensation and an accumulated measure of past firm performance after controlling for firm size and executive position. Lambert and Larcker (1987, 113) find that, "[C]ash compensation exhibits a strong positive time-series relation with ROE (return on equity), but only a modest time-series relation with RET (stock return)." Kerr and Bettis (1987) do not find evidence that boards of directors consider stock performance when changing CEOs' salaries and bonuses. Hill and Phan (1991) find that both absolute cash compensation and changes in cash compensation are significantly correlated with abnormal stock returns. Mehran (1995) uses Tobin's Q and return on assets to measure firm performance. Mehran finds both measures of firm performance to be significantly correlated with both the percentage of compensation that is equity based and with the CEO's level of personal ownership. The current study adds to the executive compensation literature in the following ways: First, this study addresses the issue, unaddressed by Mehran (1995), of the time lag between executive decision and firm performance raised by Milkovich and Rabin (1991, 90-91), "If we are interested in the effects on performance of long-term incentives, for example, then we should be examining tomorrow's performance. It is questionable whether looking at the relationship between today's pay and today's performance is appropriate." At present, this lag issue has gone largely unaddressed in the empirical compensation literature.[2] This study addresses this issue by examining firm performance subsequent to the year of executive compensation.

Secondly, this study addresses the specific effects of different components of compensation by using the detail available in proxy data. This detail allows tests that suggest that annual bonuses and stock options have significantly different effects on long-term subsequent firm performance. The degree of detail in the current study is greater than that used by Mehran (1995). For example, the current study analyzes the effects of stock options and restricted stock separately from other long-term components while Mehran uses a single "equity-based" component.

Thirdly, the issue of risk-aversion is addressed by examining the effects on subsequent performance as the relative importance of personal stock ownership becomes larger in relation to the size of total compensation. Mehran (1995) addressed the incentive effects of personal ownership and found additional ownership by CEOs to be significantly correlated with contemporaneous firm performance. The current study finds the same contemporaneous relationship, however, the analysis of subsequent firm performance reveals the positive contemporaneous effects are more than offset by negative long-term effects. The remainder of this study is organizes as follows. Section 2 employs an adaptation of Holmstrom's (1979) agency model in developing testable hypotheses. Section 3 describes the two-stage regression models and the sample selection process. Section 4 reports the empirical results and Section 5 concludes.

2. Agency theory and the hypotheses

Holmstrom's (1979) formulation of the agency model is adapted to develop testable hypotheses regarding the incentive effects of different components of compensation, and more specifically, the effects of various incentives on subsequent firm performance: [3]

$$\max_{s(x,y),a(z)} \int G(x - s(x,y))f(x,y \mid z, a(z))p(z)dxdydz \quad (1)$$

$$\text{subject to } \int U(s(x,y))f(x,y|\,,a(z))p(z)dxdydz - \int V(a(z))p(z)dz \geq \overline{H} \quad (2)$$

$$a(z) \in \arg\max_{a' \in A} \int U(s(x,y))f(x,y|\ z, a')dxdy - V(a'),\ \forall z \quad (3)$$

where s(x,y) represents the compensation contract, i.e., the sharing rule between principal (the firm) and agent (CEO); x represents the outcome, terminal cash flows of the firm before the agent's compensation; y represents some signal observed by both principal and agent that is correlated with x, but more timely; z represents some additional signal about the state of nature privately observed by the agent after the contract is set, but before either x or y

[2] Two exceptions are Abowd (1990) and Holthausen and Larcker (1993). Abowd finds that the sensitivity of managerial compensation to firm performance in one period is positively related to firm performance in the next period. Holthausen and Larcker find that entrenched CEOs are associated with negative subsequent accounting performance.

[3] This model is based on Holmstrom (1979) equations (22), (23), and (24). Holmstrom's original assumptions of a single period model and an observable outcome x are maintained. However, for the purposes of this study, x is not necessarily observable in a timely manner.

is realized; and a(z) represents the agent's action choices (decisions) given signal z.

Future share price represents an outcome that results at least partially from the manager's choices and decisions. When future share price represents the outcome x, the outcome is observable by both principal and agent at some future date. Measures correlated with x, and mutually observable on a timelier basis, are current share price and/or accounting income. These are represented in the model by y. Private information obtained by the CEO between the time of contracting and the time x and y are observed is represented by z (e.g., market conditions, interim sales or cost figures, and internal management reports). Equation (4) is a theoretical compensation model based on the agency model specified above:

$$s(x,y) = k + h(y) + g(x) \quad (4)$$

where k represents the fixed component of compensation, annual salary; h(y) represents the short-term variable component of compensation that is a function of timely measures of firm performance y; and g(x) represents the long-term variable component of compensation that is a function of the outcome x.

The amount of compensation is represented in the agency model by the level of s(x,y) without regard to the functional form or dependence of compensation on either x or y. If, as is often argued by compensation committees, larger total executive compensation is required to attract, retain, and motivate those most qualified to manage, one would expect that a better quality executive decisions should be available in return for higher compensation. One could further expect that if compensation committees correctly assessed the abilities and required compensation of their managers, the subsequent performance of those firms paying higher compensation would be superior to those paying less as the results of these superior decisions were realized.

H1: If better quality executive decisions can be purchased with higher compensation, the subsequent performance of firms paying more should be superior to the performance of firms paying less.

Tests of this hypothesis are addressed empirically because the analytical literature gives us little direction with regard to this question. The agency model set forth above clearly shows that compensation directly reduces the principals' residual interest. However, it does not describe how the amount of compensation affects the probability distribution of x. This fact precludes the agency model from predicting whether the principals' residual interests will be increased or reduced by higher compensation.[4]

Compensation form is represented by the functional form of s(x, y). Compensation form is determined by the extent that total compensation is determined by measures of x and/or y. The agency literature provides extensive direction concerning compensation form.[5] A consistent premise in this literature is that contracts incorporating information revealing the agents' unobservable effort will result in lower agency costs than will flat wage contracts. That is, compensation contracts of the form s(x, y) = k+h(y)+g(x) are strictly preferred by principals to contracts of the form s = k. Agency literature supports the benefits of contracting in such a way that the manager will "think more like an owner." Including g(x) and h(y) in compensation contracts are seen as ways of aligning the interests of managers and owners. Although the empirical literature has documented widespread use of variable executive compensation contracts, this literature has not addressed the question of whether or not firms are better off.[6] Are short-term and long-term firm performance affected by linking management compensation to interim measures of firm performance or to firms' long-term stock prices? If managers are rational, act in their own best interests, and if their decisions have the ability to influence firm performance, the following should be observed: (1) Contracts more dependent on short-term measures such as bonuses should result in superior firm performance over the short-term. (2) Contracts more dependent on long-term incentives should result in subsequent firm performance that reflects the influence of these incentives.[7]

The empirical question is whether different forms of compensation have sufficient incentive effects on managers' decisions to result in measurable differences in firm performance. If compensation forms have sufficient incentive effects, and CEOs behave rationally in response to these incentives, the following should be observed:

H2: Ceteris paribus, compensation contracts containing greater percentages of short-term incentives, i.e., larger percentages of total compensation determined by h(y), will result in above average firm performance in the near term.

H3: Ceteris paribus, compensation contracts containing greater percentages of deferred long- term incentives, g(x), will result in above average firm performance over a time horizon consistent with the deferral period.

[4] For an analytical defense of large executive compensation, see Rosen (1982).

[5] Examples include Jensen and Meckling (1976), Holmstrom (1979, 1982), Fama (1980), Diamond and Verrecchia (1982), Lambert (1983), Holmstrom and Milgrom (1987), Fudenberg et al. (1990), Bushman and Indjejikian (1993), Kim and Suh (1993), and Lambert (1993).

[6] Examples include Murphy (1985), Lambert and Larcker (1987), Barro and Barro (1990), Janakiraman et al. (1992), and Sloan (1993).

[7] Long-term incentives include stock options, stock appreciation rights, restricted stock, and other components of compensation that make the CEO's final compensation for one period dependent on the firm's performance over subsequent periods. For a discussion of this argument, see Bizjak et al. (1993). Mehran (1995) addresses the effects of "equity-based" compensation; however, Mehran does not address the timing of these effects.

An additional empirical question raised by Porter's (1992) horizon problem is whether the incentives to increase near-term firm performance set out in hypothesis H2 come at the expense of long-term firm performance. This leads to hypothesis H4:

H4: Compensation contracts containing greater percentages of short-term incentives, i.e., larger percentages of total compensation determined by h(y), will result in below average firm performance over the long-term.

It is well documented in the literature (e.g., Jensen and Murphy 1990b) that while CEOs rarely own large percentages of the company they manage, personal stock ownership in the company they manage often represents a large portion of a CEO's personal wealth. When personal stock ownership is considered, the total wealth a CEO derives from the firm and that is dependent on firm performance is the sum of compensation s(x, y) and the returns on personal stock ownership j(x). Since both shareholders and CEO benefit as x becomes larger, larger personal ownership, larger j(x), is commonly assumed to provide an alignment of interests, i.e., incentives consistent with those hypothesized for g(x). Sloan (1993, 79), argues ownership may be an omitted variable in CEO incentive analysis, "[H]igh CEO stock holdings provide a strong link between CEO wealth and firm performance." Conversely, when one considers that non-diversified CEOs may have a much greater aversion to risk than well-diversified shareholders, the alignment-of-interests assumption may no longer hold. When g(x) is comprised of stock options with strike prices equal to, or above, market, these options provide the CEO with a low risk incentive to increase future share prices (see Jackson and Lazear, 1991). Alternatively, personal stock holdings represent wealth that could be lost. This could add to the human capital motivation, suggested by Jensen and Meckling (1976, 126), in explaining why risk-averse CEOs may make overly conservative decisions that work to the detriment of long-term firm value. If the shared-outcome incentive of personal stock ownership is pervasive, one would expect above average subsequent firm performance as the ratio of j(x)/(s(x, y)) increased. Alternatively, if the risk-aversion incentive is pervasive, one could observe below average subsequent firm performance as the ratio of j(x)/(s(x, y)) increased. Because of the conflicting nature of these two incentives, hypothesis H5 is stated in the null form.

H5: Increases in the importance of personal stock ownership to the importance of compensation, evidenced by increases in the ratio j(x)/(s(x, y)), will have no effect on subsequent firm performance.

3. The empirical tests

3.1 The sample

This study examines the compensation of 137 CEOs from 56 firms representing seven industries over a 16-year period from 1977 through 1992. Four of the industries are each represented by eight firms with the same four-digit SIC codes: 2661, paper mills; 2800, chemicals and applied products; 2911, petroleum refining; and 6021, national commercial banks. The other three industries are each represented by eight firms with the same three-digit SIC codes: 356x, industrial machinery and equipment manufacturers; 371x, motor vehicle and motor vehicle parts manufacturers; and 372x, aircraft and aircraft parts manufacturers.[8]

All industries with a minimum of eight firms with all required data are included.[9] This study employs three-digit and four-four-digit industry definitions to more accurately control for industry effects. Eight firms per industry represents a compromise between industry information and sample size. All industries are equally represented in the sample to prevent industries with a large number of firms (SIC codes 2911 and 6021) from dominating the analysis. Sample firms from industries with more than eight eligible firms are randomly selected. All sample firms have: financial information available on COMPUSTAT for years 1976 through 1993; calendar year ends such that the proxy and financial statement data for all firms cover concurrent time periods; monthly stock return information available on CRSP for years 1973 through 1993; annual proxy statements in the SEC-File with sufficient information to determine the CEO's total compensation, age, years of service, and personal stock holdings; and no more than one missing interior year of proxy information (Eliminating all firms with any missing proxies would have resulted in an extremely small sample. Subsequent to screening the SEC-File index, two firms were each found to have a second unusable proxy, resulting in a second missing interior year).

The full sample contains all firm- year observations with all required information, the bonus sample contains only those observations where the proxy statement separated cash compensation into salary and annual bonuses, and the pooled sample contains the 46 firms that have a complete time series of proxies for firm years 1980 through 1992. Table 1 provides information on the samples. Panel A reports

[8] The SIC code classifications are based on the 1992 COMPUSTAT Primary Industrial File. Four firms appear under different classifications in the 1993 file and three more in the 1994 file. This affects 4 observations used in the estimation of the compensation models and 11 observations in the estimation of the firm performance models.

[9] Several prior studies have included an examination of industry. Deckop (1988) employs the ten largest firms in each of twelve two-digit industries over a five-year period. Kostiuk (1990) uses a 1980 cross-sectional sample that includes 258 observations from thirteen two-digit industries, but does not reveal the distribution of firms over industries. Ely (1991) obtains a 501 firm year sample using 173 firms from four four-digit industries. Hill and Phan (1991) use data from seven industries over an eleven-year period. Hill and Phan do not define their industries in terms of SIC codes, but they list two industries with four firms each and one with 54.

the 865, 435, and 598 usable firm-year observations of the full, bonus, and pooled samples, respectively. Panel B reports the make up of the samples by industry and Panel C reports the make up of the samples by year.

Table 1. Sample information

Panel A – Samples	
Potential firm year observations (56 firms x 16 years)	896
Sample firm years with missing proxy information	30
Sample firm acquired in 1992	1
Usable observations in full sample	865
Firm years without cash bonus information	430
Usable observations in bonus sample	435
Usable firm year observations in pooled sample (46 firms x 13 years)	598

Panel B - Usable Firm-Year Observations in Samples by Industry

	2621	2800	2911	356x	371x	372x	6021
Full	126	120	122	125	126	124	122
Bonus	59	61	73	41	76	57	68
Pooled	91	78	65	104	91	104	65

Panel C - Usable Firm-Year Observations in Samples by Year

	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Full	50	52	48	55	56	55	55	55	54	52	55	56	56	56	56	54
Bonus	24	19	18	20	20	16	17	17	23	22	25	28	28	51	53	54
Pooled				46	46	46	46	46	46	46	46	46	46	46	46	46

Table 2 reports summary statistics regarding the sample firms in Panel A and regarding the CEOs in Panel B. Panel A reveals the large diversity in firm size, total assets of $14 million to $230.6 billion. Panel B reveals a large diversity in total compensation, $86,667 to $21.7 million; compensation form, no options issued (354 observations) to $14.4 million in options; and CEO firm ownership, 0.004% to over 50% of common stock.

Table 2. Summary statistics

Panel A - Firm Information (dollar amounts in millions)

Variable	Sample	# of obs.	Minimum	Maximum	Mean	Median
TA	Full	865	$14.0	$230,640	$16,065	$2,686
	Bonus	435	$18.0	$230,640	$19,699	$4,143
MKTVALCS	Full	865	$3.5	$75,917	$3,549	$1,079
	Bonus	435	$7.0	$75,917	$4,710	$1,684
MKTVALCM	Full	865	$12.8	$232,760	$19,699	$3,031
	Bonus	435	$25.7	$232,760	$21,696	$4,041
ROA	Full	865	-0.2247	0.2428	0.0613	0.0666
	Bonus	435	-0.0902	0.2015	0.0557	0.0609
STKRET	Full	865	-0.8950	4.2593	0.1629	0.1295
	Bonus	435	-0.8950	1.7967	0.1446	0.1114
DA	Full	865	0.0000	0.9410	0.1685	0.1640
	Bonus	435	0.0000	0.9410	0.1735	0.1630

TA	=	Total assets
MKTVALCS	=	Market value of common equity
MKTVALCM	=	Market value of firm (market value of equity plus book value of debt)
ROA	=	Annual return on average total assets (before extraordinary items)
STKRET	=	Annual market return on common equity
DA	=	Ratio of long-term debt to total assets

Table 2 continued

Panel B - Executive Compensation Information (dollar amounts in thousands)

Variable	Sample	# of obs.	Minimum	Maximum	Mean	Median
AGE	Full	865	34	79	58.1	59
	Bonus	435	34	79	58.3	59
TENURE	Full	865	1	48	9.2	7
	Bonus	435	1	48	8.1	6
CEOP	Full	865	0.004%	54.00%	3.17%	0.37%
	Bonus	435	0.004%	51.63%	1.57%	0.28%
TOTCASH	Full	865	$86.67	$3,730	$648	$545
	Bonus	435	$86.67	$3,730	$782	$660
BONUS	Full	na	na	na	na	na
	Bonus	369	$0.00	$2,800	$329	$266
OPTVAL	Full	511	$3.00	$14,417	$630	$267
	Bonus	280	$5.57	$14,417	$809	$326
RESTRSTK	Full	235	$12.60	$6,400	$531.16	$271.25
	Bonus	136	$21.00	$6,400	$549.88	$300.00
TOTCOMP	Full	865	$86.67	$21,710	$1,241	$820
	Bonus	435	$86.67	$21,710	$1,572	$1,034
STKVAL	Full	865	$1.24	$549,680	$8,205	$1,894
	Bonus	435	$1.65	$549,680	$8,027	$1,934

AGE	=	CEO's age in years
TENURE	=	Number of years that the CEO has been the firm's highest paid executive
CEOP	=	Percentage of common stock held by the CEO
TOTCASH	=	Total cash compensation
BONUS	=	Annual cash bonus
OPTVAL	=	Present value of stock options issued to the CEO in the current year based on the Murphy (1985) version of the Black Scholes pricing model
RESTRSTK	=	Market value of restricted stock issued to the CEO in the current year
TOTCOMP	=	Total compensation including cash, deferred amounts, restricted stock awards, and the present value of current stock option awards
STKVAL	=	Market value of the CEO's personal stock holdings

3.2. The compensation measurement model

The purpose of the compensation measurement model is to segregate actual compensation into an amount that would be expected given several common determinates of compensation and an unexpected portion that reflects discretionary actions taken by the compensation committee. The relative compensation is defined as the actual compensation as compared to the expected compensation. The residuals from compensation measurement model are used as proxies for relative CEO compensation in the firm performance models described in Section 3.3.

$$\ln(TOTCOMP)_{j,t} = \beta_0+\beta_1 \ln TA_{j,t} + \beta_2(1-NEW)ROA_{j,t-1}+\beta_3 TENURE_{j,t}+\beta_4 CEOP_{j,t}+ \beta_5 DA_{j,t} + \beta_{6,k} INDDUMB_{j,t} + \beta_{7,t} YRDUMB_{j,t} + \beta_8 CHAIR_{j,t} + \beta_9 RETYR_{j,t}+ \beta_{10} NEW_{j,t} + \varepsilon_{j,t} \quad (5)$$

where TOTCOMP represents total compensation; TA represents total assets; ROA^{t-1} represents the accounting return on average assets for the prior year; TENURE represents the CEO's tenure, years in the top management position with the firm; CEOP represents the percentage of common stock held by the CEO; DA represents the ratio of long-term debt to average total assets; INDDUMB equals 1 if the firm's industry; YRDUMB equals 1 if year of observation; CHAIR equals 1 if CEO is also chairman of the board; RETYR equals 1 if CEO is either 64 or 65 (near retirement); and NEW equals 1 if it is the CEO's first year.

The explanatory variables included in this model are based on the findings of prior studies.[10] CEO compensation, the dependent variable, is represented

[10] Murphy (1985), Barro and Barro (1990), and Lambert et al. (1991) find firm size significant. Murphy (1985), Kerr and Bettis (1987), Gibbons and Murphy (1990), and Janakiraman et al. (1992) find firm performance significant. Hill and Phan (1991) and Lambert et al. (1991) find CEO tenure significant. CEO ownership is included based on the findings of Sloan (1993). Deckop (1988), Kostiuk (1990), and Hill and Phan (1991) find industry to be significant. Murphy (1985) finds that CEOs holding the additional position of board chairmen receive higher compensation and Coughlan and Schmidt (1985) find compensation significantly different for CEOs near to retirement, i.e., 64 or 65 years old.

in this study by TOTCOMP.[11] TOTCOMP is the estimated present value of all compensation received in a given year, excluding the present value of future pension payments. TOTCOMP includes salary, annual bonus, fringe benefits, deferred cash compensation, and the estimated present values of following components in the year of grant: stock options, stock appreciation rights, book value appreciation units, and restricted stock awards. TOTCOMP is consistent with the compensation measure used by Murphy (1985). The natural logarithms of compensation and total assets are used to control for the effects of extreme observations and maintain consistency with earlier studies including Murphy (1985) and Barro and Barro (1990).[12]

The compensation measurement model is a covariance model with indicator variables allowing individual intercepts for industry, year, board chairman, retirement year, and new CEOs (Model (12.52), Kmenta 1986, 630). The model also contains five continuous variables to control for firm size, prior period firm performance, CEO tenure, personal stock ownership, and financial structure.

The firm performance measure, ROA, is the actual after-tax return on assets before extraordinary items unadjusted for industry or market averages. Unadjusted ROA is consistent with what is observed in practice (Janakiraman et al. 1992). ROA is included from year t-l because cash bonuses may be reported in the year paid rather than earned, and the fixed portion of compensation may be adjusted after the prior period's performance is observed (Kerr and Bettis 1987). The performance variable is set to zero for new CEOs by using the indicator variable NEW because it may be unreasonable to assume that a new CEO's compensation is based on prior firm performance.

While Murphy (1985) used the CPI to control for differences between years, this study uses indicator variables to free expected compensation from being linear in time or from being perfectly correlated with general price levels. The indicator variables for SIC code 2621 and 1977 are suppressed to avoid full rank problems. Table 3 reports the results of estimating the compensation model, Equation (5).

Columns (1) and (2) report the regression results from estimating restricted forms of the compensation model. Column (1) reports results that do not include controls for year or industry. Column (2) reports results that include indicators to control for year, and column (3) reports results from the full model. The F-statistics based on the reduction in SSE resulting from adding controls for year and industry strongly support the increased explanatory power of including industry and year as explanatory variables ($p<0.01$).

The t-statistic significance levels, reported in Table 3, should be viewed with some caution in that no attempt is made to control for potential autocorrelation. However, the estimated coefficients are unbiased and as a result the residuals, RELCOMP, used in the firm performance models are also unbiased. Even if the significance levels are overstated, this model appears to explain much of the variability in total compensation. The results are also consistent with prior literature. Compensation is highly correlated with firm size, prior period accounting returns, and tenure.

The compensation model is employed to control for the underlying differences between companies and years that determine expected compensation. The residuals from estimations of this model are then used as an unbiased proxy for relative compensation.

$$RELCOMP_{j,t} = \ln(TOTCOMP)_{j,t} - E[\ln(TOTCOMP)_{j,t}] \quad (6)$$

where $\ln(TOTCOMP)_{j,t}$ represents the actual level of compensation and $E[\ln(TOTCOMP)_{j,t}$ represents the expected levels of compensation.

3.3 The Firm Performance models

The firm performance models described below are based on the following sequence of events:

(1) Prior to t-l the CEO and firm set a contract that will compensate the executive for services performed during the year beginning at t-l and ending at t.

(2) The CEO makes decisions that affect current and future firm performance during the year.

(3) Compensation resulting from the contract is observable at t.

(4) Contemporaneous firm performance is observable at t and subsequent firm performance is observable over subsequent periods at times t+k.

[11] Many prior studies, including Coughlan and Schmidt (1985), Lambert and Larcker (1987), Leonard (1990), Abowd (1990), and Sloan (1993), analyze only the cash component of compensation. When the firm performance analysis was repeated using total cash as the compensation measure, the conclusions regarding the hypotheses were consistent with the conclusions drawn using TOTCOMP.

[12] Although the Box-Cox findings of Lambert and Larcker (1987) did not support the use of logarithm transformations, their findings did not indicate that logarithm transformations would significantly alter results such as those found in this study.

Table 3. Compensation model - regression results (t-values in parentheses)

ln(TOTCOMP)		(1)	(2)	(3)
INT	+	10.694	10.277	10.305
		(84.84)	(81.26)	(78.65)
		***	***	***
ln(TA)	+	0.304	0.282	0.306
		(26.04)	(28.56)	(26.77)
		***	***	***
(1-NEW)ROA_{t-1}	+	2.388	3.553	1.614
		(4.65)	(8.02)	(3.59)
		***	***	***
TENURE	+	0.001	0.003	0.003
		(0.15)	(1.11)	(1.30)
CEOP	?	-0.006	-0.007	-0.003
		(-2.24)	(-3.19)	(-1.57)
		**	***	*
DA	+	1.216	0.698	0.095
		(7.14)	(4.80)	(0.64)
		***	***	
INDUMB	na	no	no	yes
YRDUMB	na	no	yes	yes
CHAIR	+	0.244	0.232	0.246
		(4.35)	(4.96)	(5.45)
		***	***	***
RETYR	+	-0.014	-0.075	-0.088
		(-0.55)	(-1.18)	(-1.50)
NEW	-	0.148	0.193	0.114
		(1.75)	(2.71)	(1.72)
R^2		0.520	0.666	0.719
SSE		344.96	236.33	196.85
F-statistic			25.77	27.91
			***	***

Significance tests are one-sided when a sign is predicted and two-sided when the sign is ambiguous. ***, **, and * represent p-values of < 0.01, 0.05, and 0.10, respectively.

ln(TOTCOMP)	=	Natural logarithm of total compensation (dependant variable)
ln(TA)	=	Natural logarithm of total assets
(1-NEW)ROA_{t-1}	=	Return on assets in year t-1 if CEO is not in first year and zero otherwise
TENURE	=	Number of years that the CEO has been the firm's highest paid executive
CEOP	=	Percentage of common stock held by the CEO
DA	=	Ratio of long-term debt to total assets
INDUMB	=	One if firm's industry and zero otherwise
YRDUMB	=	One if year t and zero otherwise
CHAIR	=	One if CEO is also chairman of the board and zero otherwise
RETYR	=	One if CEO is near retirement, 64 or 65, and zero otherwise
NEW	=	One if the CEO is in first year in position and zero otherwise
F-statistic	=	Significance of adding industry and year indicator variables to the model

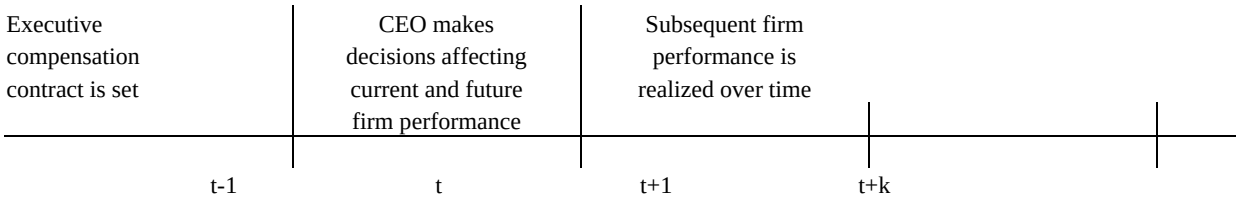

Fig.1. Timeline of events

The hypotheses are tested by estimating the firm performance models over four performance periods. A contemporaneous performance period, t+0, facilitates comparisons with prior work.[13] The t+l performance period, i.e., the following year, provides a measure of short- term subsequent performance, and t+3 and t+5 performance periods provide measures of long- term firm performance.

The selection of t+3 and t+5 as measures of long-term performance is arbitrary. However, they are consistent with the discussion of Bizjak et al. (1993) who argue that the compensation time horizon should be consistent with the period needed to remove asymmetries in information between principal and agent. Observed holding periods of three to five years for stock or stock options, and similar observed accumulation periods for stock or book appreciation rights are consistent with these performance periods. While some holding and accumulation periods are even longer, data and noise considerations make t+3 and t+5 seem reasonable.[14]

While there is no consistent evidence that relative performance measures are employed in CEO compensation contracts (Janakiraman et al. 1992), numerous studies have argued the appropriateness of relative measures when assessing executive performance (Holmstrom 1982; Gibbons and Murphy 1990; Scholes 1991). Because the purpose of measuring subsequent firm performance in this study is to provide a proxy for CEO decision outcomes, relative measures are employed to remove market-wide and industry-wide effects. It is assumed that firms in the same industry and year face a homogeneous external environment containing similar factors over which CEOs will have little influence.

Furthermore, this study uses market returns as the measure of firm performance because this measure seems most appropriate when measuring shareholders' utility. Sloan (1993,56) argues that the objective of shareholders is to maximize the market value of the firm. Relative firm performance (RSTKRET) is the relative return on beginning of the year market value of common equity. The relative measure (RSTKRET) is the cumulative annual return on common stock including dividends reported by CRSP adjusted for an equally weighted average return of the other sample firms from the same industry and year.[15] The firm performance models are represented by Equation (7):

$$\begin{aligned} \text{RSTKRET(k)}^{jt} &= \phi_0 + \phi_1 \text{RELCOMP}^{j,t} + \phi_2 \text{DA} \\ &\text{j,t+k} + \phi_3 \text{BONUSPj,t} + \phi_4 \text{STKOPTj,t} + \phi_5 \\ &\text{RSTOCKPj,.t} + \phi_6 \text{0THERPj,t} \qquad (7) \\ &+ \phi_7 \text{STOCKP j,t} + e_{j,t} \end{aligned}$$

where RSTKRET(k) represents the relative cumulative stock return over year(s) t+k; RELCOMP represents relative compensation; DA(k) is the average ratio of long-term debt to total assets ratio over year(s) t+k; BONUSP represents the percentage of total compensation comprised of annual bonus; STKOPTP represents the percentage of total compensation comprised of the present value of stock options and/or stock appreciation rights granted in the current year; RSTOCKP represents the percentage of total compensation comprised of the market value of restricted shares granted in the current year; and OTHERP represents the percentage of total compensation comprised of other deferred components of compensation, such as book value units.[16] STOCKP represents the end-of-the-year market value of the CEO's personal holdings in company stock divided by total compensation.

The four components of compensation are included in the model to test the hypotheses regarding the effects of short-term and long-term incentives on subsequent firm performance. The three long-term incentive components are included at their estimated present values in the year of grant. The present value of stock options and stock appreciation rights are estimated by using Murphy's (1985) adaptation of Black and Scholes (1973) pricing model.[17] Also following Murphy (1985), restricted stock awards are included at their market value in the year of grant. The present value of book value units is estimated by using past performance and a 10% discount factor.[18] DA(k) is included to control for comparative risk of the firm during performance period k.[19]

Table 4 presents summary statistics for the variables used in the firm performance models. Panel A provides summary statistics on relative market return

[13] Examples include Lewellen and Huntsman (1970), Coughlan and Schmidt (1985), Murphy (1986), Deckop (1988), Barro and Barro (1990), Kostiuk (1990), Gibbons and Murphy (1990, 1992), Hill and Phan (1991) Main (1991), and Mehran (1995).

[14] Holthausen and Larcker (1993) also use one, three, and five year performance periods.

[15] A complete definition of the relative market return variable is presented in Appendix A.

[16] Salary and annual bonus can only be analyzed separately when reported separately in the proxy statements. Therefore, BONUSP is only included in estimations of Equation (7) over the bonus sample.

[17] Murphy adds the analysis of dividends to the original model. For a complete explanation of this options pricing model see Black and Scholes (1973) and Murphy (1985).

[18] The present value of currently awarded book value units is calculated by summing earning per share over a period equal to the accumulation period. A 10% discount factor is applied to reach a present value. Earnings per share is used to proxy increases in book value in that most recipients of these units also accumulated dividends over the deferral period.

[19] When k=0 or 1, DA is included for a single year. For the long-term performance periods, k=3 and k=5, DA(k) is the average DA over the included years.

variables. RSTKRET0 is the single-year relative return in the year of compensation. RSTKRET1 is the single-year relative return for the following year, and RSTKRET3 and RSTKRET5 are the relative cumulative returns over three and five year accumulation periods following the year of compensation. Panel B reports summary statistics for the explanatory variables.

Table 4. Relative firm performance and compensation form variable - summary statistics

Panel A: Relative Firm Performance						
Variable	Sample	# of obs.	Minimum	Maximum	Mean	Median
RSTKRET0	Full	865	-1.066	3.781	-0.006	-0.037
	Bonus	435	-1.066	1.471	-0.025	-0.040
RSTKRET1	Full	865	-1.066	3.781	0.001	-0.034
	Bonus	435	-1.066	1.471	-0.031	-0.044
RSTKRET3	Full	755	-2.328	7.666	0.001	-0.111
	Bonus	328	-1.819	4.528	-0.090	-0.100
RSTKRET5	Full	643	-4.357	14.628	0.003	-0.157
	Bonus	249	-3.834	4.216	-0.119	-0.138
Panel B: Compensation Form Variables						
Variable	Sample	# of obs.	Minimum	Maximum	Mean	Median
RELCOMP	Full	865	-1.232	2.307	0.000	-0.029
	Bonus	435	-1.232	2.307	-0.002	-0.027
BONUSP	Bonus	369	0.00%	76.22%	24.46%	22.53%
STKOPTP	Full	511	1.03%	87.44%	29.87%	25.97%
	Bonus	280	2.06%	85.21%	31.34%	26.40%
RSTOCKP	Full	235	1.73%	86.11%	24.30%	20.54%
	Bonus	136	4.48%	72.24%	23.10%	19.52%
OTHERP	Full	92	1.42%	52.31%	18.88%	17.29%
	Bonus	35	4.84%	47.53%	20.16%	18.36%
STOCKP	Full	865	0.35%	69,284%	1,604%	198%
	Bonus	435	1.08%	54,371%	900%	172%
RSTKRET0	=	Relative stock return over years 0.				
RSTKRET1	=	Relative stock return over years 1.				
RSTKRET3	=	Relative cumulative stock return over years 1-3.				
RSTKRET5	=	Relative cumulative stock return over years 1-5.				
RELCOMP	=	Relative compensation (residual from the compensation model)				
BONUSP	=	The percentage of TOTCOMP comprised of the annual bonus (Bonus sample only)				
STKOPTP	=	The percentage of TOTCOMP comprised of the present value of stock options and stock appreciation rights granted in the current year				
RSTOCKP	=	The percentage of TOTCOMP comprised of the present value of stock options and stock appreciation rights granted in the current year				
OTHERP	=	The percentage of TOTCOMP comprised of other deferred compensation				
STOCKP	=	CEO's personal stock holdings as a percentage of TOTCOMP				

RELCOMP provides a means of testing the effects of the amount of compensation, hypothesis H1. BONUSP provides a proxy for h(y) in the theoretical compensation model, i.e., the percentage of compensation reliant on more timely measures of firm performance. BONUSP provides a means of testing hypotheses H2 and H4. STKOPTP, RSTOCKP, and OTHERP provide measures of g(x) and a means of testing hypothesis H3. STOCKP provides a means of examining the firm performance effects as ownership becomes more important in comparison to compensation, j(x)/(s(x,y)). This provides the means of testing hypothesis H5. Regression results from OLS estimations of Equation (7) are presented in Table 5.

Table 5. Firm performance models - ols regression results (t-values in parentheses)

Panel A: Full Sample					
Dependent Var.		RSTKRET0	RSTKRET1	RSTKRET3	RSTKRET5
# of observations		865	865	755	643
INT	+	0.0073	0.1472	0.1485	0.3199
		(0.30)	(0.56)	(2.34)	(2.79)
		ns	ns	**	***
RELCOMP	+	0.0968	-0.0230	-0.0693	-0.0810
		(3.20)	(-0.63)	(-0.87)	(-0.56)
		***	ns	ns	ns
DA(k)	?	-0.1498	-0.2321	-1.0792	-2.3295
		(-1.74)	(-2.45)	(-4.57)	(-5.24)
		*	**	***	***
STKOPTP	+	0.0197	0.1852	0.3903	0.7111
		(0.28)	(2.48)	(2.09)	(2.10)
		ns	***	**	**
RSTOCKP	+	-0.0261	-0.1301	-0.3503	-0.2483
		(-0.28)	(-1.30)	(-1.39)	(-0.55)
		ns	ns	ns	ns
OTHERP	+	-0.0604	0.1504	0.5749	0.6882
		(-0.37)	(0.85)	(1.42)	(1.01)
		ns	ns	ns	ns
STOCKP	?	0.0072	-0.0001	-0.0012	-0.0020
		(3.33)	(-0.53)	(-2.30)	(-2.36)
		***	ns	**	**
Adjusted R^2		0.026	0.011	0.034	0.047
Significance tests are one-sided when a sign is predicted and two-sided when the sign is ambiguous. ***, **, and * represent p-values of < 0.01, 0.05, and 0.10, respectively					
RSTKRET0	=	Relative stock return over years 0			
RSTKRET1	=	Relative stock return over years 1			
RSTKRET3	=	Relative cumulative stock return over years 1-3			
RSTKRET5	=	Relative cumulative stock return over years 1-5			
RELCOMP	=	Relative compensation (residual from the compensation model)			
DA(K)	=	Average long-term debt to total assets ratio over cumulative relative stock return period			
STKOPTP	=	The percentage of TOTCOMP comprised of the present value of stock options and stock appreciation rights granted in the current year			
RSTOCKP	=	The percentage of TOTCOMP comprised of current grants of restricted stock			
OTHERP	=	The percentage of TOTCOMP comprised of other deferred compensation			
STOCKP	=	CEO's personal stock holdings as a percentage of TOTCOMP			

Because the OLS estimations of Equation (7) exhibit significant autocorrelation over the three and five firm performance periods, the three and five year models are re-estimated using GLS.[20] Durbin-Watson test statistics and estimates of first-order autocorrelation are obtained by estimating the pooled regression model described by Kmenta (1986, 616-625) over the pooled sample. The GLS estimations incorporate these estimates of first-order autocorrelation and the Prais-Winsten method of transformation. The GLS results for the three and five year estimations are reported in Table 6.

[20] The Durbin-Watson test statistics from estimations over the pooled sample for the t+0, t+l, t+3, and t+5 subsequent performance periods are 1.8877, 1.9208, 0.7515, and 0.5847, respectively. These test statistics indicate significant autocorrelation, p<0.0 1, for the three and five year estimations. The corresponding ρ s for the three and five year models are 0.5140 and 0.6149.

Table 5 (continued). Firm performance models - ols regression results (t-values in parentheses)

Panel B: Bonus Sample					
Dependent Var.		RSTKRET0	RSTKRET1	RSTKRET3	RSTKRET5
# of observations		435	435	328	249
INT	+	-0.0730	0.0901	0.2129	0.1091
		(-1.55)	(1.85)	(1.69)	(0.50)
		ns	*	*	ns
RELCOMP	+	0.0719	-0.0154	-0.1495	-0.2700
		(2.08)	(-0.44)	(-1.85)	(-1.65)
		**	ns	ns	ns
DA(k)	?	-0.0408	-0.2570	-0.9202	-2.3404
		(-0.38)	(-2.27)	(-2.80)	(-3.77)
		ns	**	***	***
BONUSP	+ or -	0.1762	-0.3175	-0.6272	-0.0268
		(1.61)	(-2.83)	(-2.12)	(-0.52)
		*	***	***	ns
STKOPTP	+	0.0532	0.0092	0.1122	0.8810
		(0.57)	(0.10)	(0.43)	(1.91)
		ns	ns	ns	**
RSTOCKP	+	0.0585	-0.1865	-0.3844	0.0974
		(0.49)	(-1.51)	(-1.09)	(0.16)
		ns	ns	ns	ns
OTHERP	+	0.0421	0.2656	0.8769	1.9367
		(0.18)	(1.12)	(1.49)	(1.99)
		ns	ns	*	**
STOCKP	?	0.0003	-0.0003	-0.0027	-0.0031
		(1.02)	(0.97)	(-2.71)	(-2.38)
		ns	ns	***	**
Adjusted R^2		0.016	0.023	0.050	0.060

Significance tests are one-sided when a sign is predicted and two-sided when the sign is ambiguous. ***, **, and * represent p-values of < 0.01, 0.05, and 0.10, respectively. The expected sign on bonus is positive in t=0 and negative thereafter.

RSTKRET0	=	Relative stock return over years 0
RSTKRET1	=	Relative stock return over years 1
RSTKRET3	=	Relative cumulative stock return over years 1-3
RSTKRET5	=	Relative cumulative stock return over years 1-5
RELCOMP	=	Relative compensation (residual from the compensation model)
DA(K)	=	Average long-term debt to total assets ration over cumulative relative stock return period
BONUSP	=	The percentage of TOTCOMP comprised of the annual bonus
STKOPTP	=	The percentage of TOTCOMP comprised of the present value of stock options and stock appreciation rights granted in the current year
RSTOCKP	=	The percentage of TOTCOMP comprised of current grants of restricted stock
OTHERP	=	The percentage of TOTCOMP comprised of other deferred compensation
STOCKP	=	CEO's personal stock holdings as a percentage of TOTCOMP

Table 6. Firm performance models - gls regression results (t-values in parentheses)

Dependent Var.		RSTKRET3		RSTKRET5	
Sample		Full	Bonus	Full	Bonus
# of observations		755	328	643	249
INT	?	0.0661	0.2172	0.1240	0.1588
		(1.50)	(2.88)	(1.85)	(1.64)
		ns	***	*	ns
RELCOMP	+	-0.1743	-0.0756	-0.1059	-0.0646
		(-2.08)	(-0.76)	(-0.79)	(-0.47)
		ns	ns	ns	ns
DA(k)	?	0.9558	-0.9276	-1.8195	-2.2837
		(-2.77)	(-1.96)	(-2.76)	(-2.73)
		***	**	***	***
BONUSP	-		-1.0205		-0.2455
		na	(-3.79)	na	(-0.64)
			***		ns
STKOPTP	+	0.3085	-0.3247	0.2936	0.1088
		(1.67)	(-1.29)	(0.99)	(1.31)
		**	ns	ns	ns
RSTOCKP	+	0.0312	-0.4351	0.0707	-0.1675
		(-0.13)	(-1.33)	(0.18)	(-0.36)
		ns	ns	ns	ns
OTHERP	+	0.4846	0.0552	0.4010	0.6699
		(1.24)	(0.10)	(0.69)	(0.98)
		ns	ns	ns	ns
STOCKP	?	-0.0012	-0.0012	-0.0017	-0.0016
		(-1.89)	(-1.33)	(-1.83)	(-1.45)
		*	ns	*	ns
Adjusted R^2		0.015	0.058	0.009	0.019

Significance tests are one-sided when a sign is predicted and two-sided when the sign is ambiguous. ***, **, and * represent p-values of < 0.01, 0.05, and 0.10, respectively

RSTKRET3	=	Relative cumulative stock return over years 1-3
RSTKRET5	=	Relative cumulative stock return over years 1-5
RELCOMP	=	Relative compensation (residual from the compensation model)
DA(K)	=	Average long-term debt to total assets ration over cumulative relative stock return period
BONUSP	=	The percentage of TOTCOMP comprised of the annual bonus
STKOPTP	=	The percentage of TOTCOMP comprised of the present value of stock options and stock appreciation rights granted in the current year
RSTOCKP	=	The percentage of TOTCOMP comprised of current grants of restricted stock
OTHERP	=	The percentage of TOTCOMP comprised of other deferred compensation
STOCKP	=	CEO's personal stock holdings as a percentage of TOTCOMP

4. Results

If the degree of autocorrelation used to estimate the GLS models were known, these models would be "best linear unbiased" estimators and the GLS estimators would be strictly superior to the OLS estimators (Judge et al. 1988, 332). However, because the degree of autocorrelation is an estimate, it cannot be said with certainty the GLS estimators are more efficient (Judge et al. 1988, 402). Furthermore, because both estimators are "unbiased" (Judge et al. 1988, 332), both the OLS results presented in Table 5, and the GLS results presented in Table 6, are used in evaluating the hypotheses proposed in Section 2.

4.1. Compensation amount - hypothesis H1

It is hypothesized in H1 that if a better quality executive decisions could be purchased with additional compensation, there should be a significant positive relationship between relative compensation, RELCOMP, and firm performance, RSTKRET. The t+0

findings (Table 5, Panels A & B) indicate a highly significant positive contemporaneous correlation between relative firm performance and relative compensation. While the strong correlation between current performance and current compensation is consistent with prior findings (Lambert and Larcker 1987; Gibbons and Murphy 1990; Hill and Phan 1991), this study finds no evidence that the correlation of high pay and superior firm performance persist into any subsequent period. Hypothesis H1 is not supported over any of the subsequent performance periods, one, three, or five years (Tables 5 & 6).

4.2. Compensation form - hypotheses H2, H3, and H4

It is theorized in hypothesis H2 that firm performance will reflect the degree of importance placed on short-term compensation. It is expected that as the percentage of compensation comprised of the annual bonus, BONUSP, increases, the emphasis of CEO decisions will become increasingly focused on short-term performance, i.e., it is expected that there should be a positive correlation between RSTKRET and BONUSP over the near term. This hypothesis is marginally supported ($p<0.10$) for the contemporaneous results (Table 5, Panel B).

Support for hypothesis H3 is mixed. Compensation comprised of components theorized to provide long-term incentives were operationalized as three variables, STKOPTP, RSTOCKP, and OTHERP. Positive correlation between these variables and subsequent firm performance would be consistent with this hypothesis. Hypothesis H3 is supported for STKOPTP for the OLS estimations over the full sample for subsequent performance periods of one, three, and five years ($p<0.05$; Table 5, Panel A) and over the bonus sample for the five-year subsequent performance period ($p<0.05$; Table 5, Panel B). This result is repeated for the GLS estimation over the full sample for the three-year performance period ($p<0.05$; Table 6).

While the other coefficients are not significant at conventional levels, only one STKOPTP coefficient does not have the predicted positive sign, the three year GLS estimation over the bonus sample (Table 6). Hypothesis H3 is not supported for the other long-term components of compensation, RSTOCKP and OTHERP.

Hypothesis H4 states that over-reliance on short-term components of compensation, annual bonuses, will motivate executive decisions that promote short-term firm performance that comes at the expense of long-term firm performance. This hypothesis is strongly supported. The coefficients for BONUSP are significantly negative for both the OLS and GLS estimations over one and three year performance periods ($p<0.0l$; Table 5, Panel B; Table 6). The five year results are not significant at conventional levels, however, the signs are in the hypothesized negative direction.

4.3. CEO ownership - hypothesis H5

Hypothesis H5, stated in the null form, hypothesizes that increased importance of personal stock ownership will not result in any measurable difference in subsequent firm performance. It is theorized that two the contravening factors may offset one another. First, it is theorized that increased importance of ownership should motivate CEOs to make decisions that maximize firm value, i.e., decisions that also increase CEOs' personal wealth. Second, it is also recognized that non-diversified CEOs may make overly conservative decisions in response to risk-aversion and in attempts to protect current personal wealth. The market value of personal stock ownership, measured as a percentage of compensation, STOCKP, is used to test these competing propositions.

The first proposition is only supported for the full sample estimation over the contemporaneous performance period (Table 5, Panel A). The second proposition is supported by OLS estimations over both the full and bonus samples for the long-term performance periods ($p<0.05$; Table 5, Panels A & B). The GLS results for the full sample are also marginally significant ($p<0.10$; Table 6). The GLS results for the bonus sample are not significant at conventional levels; however, the coefficients remain negative.

4.4. Supplementary tests

Several supplementary tests were run to address specific concerns. Although these results are not tabulated, several of these findings provide additional credibility to the results reported above. To address the concern that the results could be driven by a single firm or industry, and the concern that the results could be driven by a few outliers, the primary models were re-estimated after eliminating observations for one industry at a time. This procedure involved re-estimation of Equations (5) and (7) over reduced samples (full sample less one industry).

To address the issue raised by Smith and Watts (1992) that firms in different industries face different investment opportunity sets, Equation (7) was re-estimated industry by industry. This procedure allowed the firm performance model coefficients to vary by industry, i.e., this allowed for the possibility that the effect on subsequent performance of an increase in STKOPTP is partially dependent on the investment opportunities of the industry. The t-statistics were aggregated across industries using the asymptotic test described by Christie (1990, 86-89).

The compensation and performance models were also re-estimated after using two alternative methods to calculate the value of stock options in the year of grant. The stock option values were recalculated using the original Black-Scholes model without adjustments for dividends and the minimum value method suggested by the FASB (Swieringa 1987).

The models were also re-estimated with the total debt to assets ratio as an alternative measure of firm risk. None of these supplemental tests produced results significantly different from those reported.

5. Conclusions and interpretations

The most important findings of this study are that both the form of CEO compensation and the ratio of personal stock ownership to compensation appear to be significant determinants of subsequent firm performance. These empirical findings strongly suggest that the form of CEO compensation, and the level of personal ownership by CEOs, may prove to be both a cause and a cure for the "short time horizon" afflicting U.S. industry raised by Porter (1992). Stock options appear to provide CEOs with incentives to maximize long-term firm value. However, it appears that the incentives provided by one of the most common forms of executive compensation, the annual bonus, actually exacerbate the horizon problem. Furthermore, the empirical findings suggest that large personal stock ownership does not provide the automatic "alignment of interest" so widely assumed in the executive compensation literature.

These results have direct implications, and raise specific questions, regarding the assumptions and findings of prior research. A common theme in recent executive compensation literature has involved analyzing and explaining the dominant use of accounting returns over market returns in compensation contracts (Sloan 1993; Bushman and Indjejikian 1993; Kim and Suh 1993). The consensus in these studies is that accounting returns may provide firm-specific information, shield executives from market wide movements in share prices, and be less costly to calculate than industry and market adjusted measures of stock returns. Sloan (1993, 56) argues that executive compensation is linked to earnings through annual bonus plans, that the stated purpose of these plans is to align the interests of CEOs and shareholders, and that the objective of shareholders is to maximize the market value of the firm.

An important point addressed in the current study, that was not addressed by Sloan or by executive compensation literature in general, is whether compensation plans actually work in the ways they are theorized to work: do annual bonuses based on accounting returns align the interests of CEO and shareholder? More specifically, do plans containing large annual bonuses based on accounting returns motivate decisions that increase firms' long-term value? The findings of this study indicate that if shareholders prefer superior long-term stock returns, heavy reliance on annual bonuses does not provide the desired incentive.

Another issue raised by in the current study that warrants further investigation is CEO risk aversion. Jensen and Murphy (1990a) dismiss risk aversion and surmise that personal stock ownership provides incentives that help align the interests of CEOs and shareholders. Jensen and Murphy (1990b, 48) state: "With few exceptions, it is clear that the best incentives are determined primarily by large CEO stock holdings."

Mehran (1995) empirically tests the effects of CEO ownership on current performance and finds a significant positive correlation. Mehran concludes that "Firm performance is positively related to the percentage of equity held by managers" (163). While the current study also finds ownership to be positively correlated with current firm performance, these findings exhibit the same temporal qualities as do annual bonuses. The findings are quite the opposite with regard to long-term performance. The long-term findings are all negative and larger than the original contemporaneous positive findings, i.e., any benefit the shareholder received in the current period is more than offset over the long-term. These long-term findings are much more consistent with a concern raised by Jensen and Meckling (1976, 126), "[M]anagers of large publicly held corporations seem to behave in a risk averse way to the detriment of equity holders."

Mehran (1995) also found a significant positive relationship between the percentage of compensation that was "equity-based" and firm performance. His findings are similar to the current findings for stock options. The findings in the current study appear to indicate that specific components aggregated in Mehran's "equity-based" compensation may not all provide the same incentives, i.e., stock options and restricted stock may provide different incentives.

One limitation of the current research design is the inability to segregate relative stock returns resulting from executive decisions from relative stock returns resulting from other adjustments in market expectations. The subsequent firm performance models begin with the market price on the last day of the year for which compensation was measured. To the extent that the market efficiently incorporated all information, including information on executive decisions, into the market price on that date, the expectation for subsequent relative returns is zero. This leaves two credible interpretations for the reversal of signs on BONUSP between the contemporaneous and subsequent performance periods, positive to negative. The first explanation is that the CEO made short-term decisions to increase his bonus during the year of compensation and these decisions came at the expense of long-term firm performance. The second explanation is that the market inflated the stock price during the year of compensation in response to the same favorable accounting returns that drove the bonus and then lowered the stock price as the temporary nature of the favorable accounting returns became known. What remains consistent across these two explanations is that neither case supports the ability of annual bonuses to provide an alignment of long-term interest between CEO and shareholder.

A second limitation is the assumption made in the current research regarding shareholder utility and

long-term firm performance. This study assumes that shareholders, the principals in the agency model, benefit from superior long-term firm performance. Considering the constantly decreasing holding periods of shareholders, measuring relative returns over three and five year holding periods may exceed the average shareholder's time horizon. Porter (1992) documents that the average holding period has fallen from seven to two years between 1960 and 1990. In fact, this leads one to wonder whether the horizon issue raised by Porter is more a result of executives not behaving in the shareholders' best interest, or if the horizon issue is also a result of shareholders' preference for near-term performance.

Finally, the results of this study should be viewed in light of the fact that the findings may be sample specific. The firms included in this study are large publicly traded mature companies from seven specific industries. Whether smaller firms, younger firms, or firms from other industries would demonstrate the same relationships between CEO compensation and subsequent firm performance remains unknown and a potential area for future research. This study reemphasizes the importance of detailed time-series data in compensation research. The use of detailed time-series data allows this study to provide insights into the actual incentives provided by various forms of CEO compensation with important implications for shareholders, stakeholders, financial analysts, and regulators.

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Appendix A: Relative MARKET RETURNS

$$RSTKRET(k)_{j,t} = STKRET(k)_{j,t} - \overline{STKRET(k)}_{i,t}$$

where $\overline{STKRET}_{i,t}$ is the average *STKRET* for the company's industry over the same year(s) where i≠j. The accumulation period is 12 months for k=0 and k=1, 36 months for k=3, and 60months for k=5. where

$$STKRET_{j,t} = \left[\prod_{y=1}^{12}\left(1+RET_y\right)\right]-1 \quad \text{for k=0 and k=1,}$$

$$STKRET_{j,t} = \left[\prod_{y=1}^{36}\left(1+RET_y\right)\right]-1 \quad \text{for k=3,}$$

$$STKRET_{j,t} = \left[\prod_{y=1}^{60}\left(1+RET_y\right)\right]-1 \quad \text{for k=5, and}$$

$$RET_y = \frac{\left(Share\ \Pr ice + Dividends\right)_y}{\left(Share\ \Pr ice\right)_{y-1}}$$

RET_y = monthly return on firm j's common shares.