

# Executive Compensation, Ownership, and Firm Performance

*Chung-Jen Fu\**

National Yunlin University of Science & Technology

## Abstract

To explore the impacts of ownership and firm performance on the contracting of CEO compensation, this paper extends Fu and Chang (1998) by incorporating managerial ownership in the model specifying a linear relationship between compensation and multiple indicators of efforts. The model shows that the optimum weights placed on market, financial and nonfinancial measures of performance are all positive when the CEO has very low equity stake in the firm. With the increases in managerial ownership, the optimum weight placed on market measure of performance is decreasing and even becomes negative. The finding reveals that managerial ownership affects executive compensation through its influence on the optimum weight placed on the market measure of performance instead of being a direct explanatory variable of executive compensation. Empirical evidence with executive compensation data in 1995-1999 is generally consistent with the predictions of the model.

**Keywords:** Executive Compensation, Managerial Ownership, and Firm Performance

## Introduction

This paper explores theoretically and empirically the determinants of executive compensation, with a special focus on the effect of ownership on the relationship between executive compensation and firm performance. The level of compensation

---

\* This research is supported by a grant from the National Science Council (89-2416-H-224-039).

and the extent of pay-for-performance for chief executive officers have been a topic of considerable interest in the academic and business communities. Being an incentive for inducing efforts in increasing firm value, executive compensation is expected to be highly associated with firm performance. It is widely accepted that a compensation contract designed on the basis of firm performance can be an effective mechanism of reducing agency costs by aligning the interests of a firm's management with its shareholders. Indeed, many empirical studies have documented that firm performance is the most influential determinant of CEO compensation (see Healy, 1985; Lambert and Larcker, 1987 ; Sloan, 1993). On the other hand, some studies have found other factors such as size, CEO tenure, and CEO's holdings of equity also affect the level of CEO compensation (see Agarwal, 1981; Cline, 1975; Hill and Phan, 1991; Allen, 1981; Finkelstein and Hambrick, 1989).

The separation of equity ownership from control of corporate decisions induces agency problems. To pursue self-interest, managers may make decisions divergent from value maximization (Berle and Means, 1932). Jensen and Meckling (1976) pioneer the analysis of agency problems with economic model and point out three forms of agency costs, which cover monitoring costs, self-bonding costs, and residual loss. Hölmstrom (1979) studies efficient contractual agreements in a principal-agent relationship under optimal risk sharing rules and indicates that additional information can generally improve the contracts. Hölmstrom and Milgrom (1991) consider nonfinancial indicators in their linear model of optimal contracting for workers performing a wide array of tasks. To reflect managers' multiple efforts, Fu and Chang (1998) integrate market, financial and nonfinancial measures of performance in constructing an optimal compensation contract. In view of the substantive managerial holdings of common stocks in the Taiwanese firms, this paper extends Fu and Chang (1998) by considering the effects of managerial ownership on optimal contracting.

A growing body of evidence indicates that management ownership is positively related to firm performance (see, for example, Yermack, 1996; Morck et al., 1988). Furthermore, Mehran (1995) argues that ownership structure and executive compensation are part of a simultaneous system that determines the firm's value and the allocation of that value among various claimants. Jensen and Meckling (1976)

also suggest that ownership structure and executive compensation are determined by each other. Empirical analysis generally suggests a negative relation between the level of CEO compensation and the CEO's ownership stake. For example, Lambert et al. (1993) find that CEO compensation is lower when the CEO's ownership is higher and when there is an internal member other than the CEO on the board. Core, Holthausen, and Larcker (1999) document evidence that ownership structure explains a significant amount of cross-sectional variation in executive compensation. Specifically, CEO compensation is a decreasing function of the CEO's equity holdings and the existence of an external blockholder who owns at least 5% of the equity.

In essence, Jensen and Meckling' framework is more adequate in explaining a manager's behavior when he owns a substantive share of the firm's equity. Hölmstrom (1979) and the subsequent studies emphasize, on the other hand, the compensation incentive for professional managers with very low percentage of equity holdings. The managers in the family-control corporations and the high-tech firms in Taiwan usually have a considerable stake in the firm's equity and their personal wealth is thus significantly influenced by their firms' stock prices. To provide optimal incentive, it is therefore important, particularly for the Taiwanese firms, to consider managerial ownership in the compensation contracts. This paper attempts to offer first a theoretical framework clarifying the interconnected relationships among executive compensation, ownership and the firm performance. To verify the prediction of the model, empirical examination is conducted with CEO compensation data in 1995-1999 for companies listed in the Taiwan Stock Exchange. By controlling for the effects of other determinants, such as firm size and dual leadership, the empirical test is designed to examine the incremental effects of ownership and firm performance on executive compensation.

Executive compensation packages generally consist of salary, bonus, and stock option. From the perspective of shareholders, security returns are a more relevant measure of performance and hence the usage of market measure of performance in compensation contracts may be more effective in increasing value than the usage of accounting measure. Nevertheless, empirical evidence indicates that financial measure of performance obtained from accounting figures (e.g., earnings per share)

is used together with market measure in firms' compensation contracts. For example, Healy (1985) analyzes a sample of 94 U.S. firms and finds in addition to the market measure of performance, financial measure of performance is employed by most of the sample firms in their executive compensation contracts. Specifically, he reports that bonus plans and long-term performance plans are based on financial measure of performance and most of the sample firms use bonus plans in their compensation contracts. Using a much larger sample, Sloan (1993) also finds the simultaneous usage of market and financial measures of performance in the compensation contracts. To explain this phenomenon, Sloan (1993) argues that as a performance measure, accounting figures can better reflect managers' efforts, whereas market returns are to some extent beyond managers' control. The evidence Sloan (1993) found is consistent with the hypothesis that using accounting figures as a performance measure in the compensation contract can protect managers from market fluctuation. With the advantage of being less sensitive to market variation and capable of providing value relevant information, accounting figures are thus widely adopted as a performance measure in CEO compensation contracts.

The remainder of this paper proceeds as follows. Section 2 extends Fu and Chang (1998) by incorporating management ownership in the model specifying a linear relationship between executive compensation and multiple indicators of firm performance. The effects of management ownership on the weights placed on market, financial, and non-financial measures of performance in the compensation contracts are rigorously analyzed. Section 3 describes the empirical design. Various measures of firm performance and other factors affecting the level of executive compensation are depicted. The empirical findings and their economic implications are discussed in Section 4. Section 5 concludes.

## **The Model**

The valuation model developed by Ohlson (1995) specifies a firm's equity value as a linear function of book value, accounting earnings and other non-financial indicators such as products quality, prompt delivery, and development of new products. Fu and Chang (1998) express this linear relationship between stock prices

(market value of the firm) and the indicators of performance as follows:

$$P = \beta_0 + \beta_1 F + \beta_2 G + \varepsilon_p \quad (1)$$

where  $P$  denotes stock prices (market value of the firm),  $F$  and  $G$  represent financial and non-financial indicators of performance, respectively.<sup>1</sup> The respective sensitivity of stock prices to the financial and non-financial indicators of performance is captured by the coefficients  $\beta_1$  and  $\beta_2$ . As better performance, demonstrated by both the financial and non-financial indicators, would lead to higher stock prices,  $\beta_1$  and  $\beta_2$  are strictly nonnegative. The effects of factors other than the financial and non-financial indicators (for example, macroeconomic and industrial factors) are reflected in the intercept  $\beta_0$ . The last term  $\varepsilon_p$  is random errors with  $N(0, \sigma_p^2)$ .

The relationship specified in equation (1) provides direction for the design of CEO compensation contracts. Tying managers' compensation to the market measure of performance is one way to mitigate the interest conflict between managers and shareholders. Nevertheless, Lambert and Larcker (1987) argue that stock prices are affected by factors other than a firm's performance and therefore compensation contracts designed exclusively on the basis of market performance measure would cause managers to bear additional risk which is to some extent beyond their control. Incorporating financial and non-financial measures of performance in the compensation contracts can alleviate the effects of those random factors unrelated to managers' actions and hence reduce the risk premium required by the managers. With these considerations, a compensation incentive scheme can be expressed in the linear form:

$$B = \alpha_0 + \alpha_P P + \alpha_F F + \alpha_G G \quad (2)$$

where  $B$  represents the level of executive compensation,  $\alpha_0$  denotes the fixed salary, and  $\alpha_P, \alpha_F, \alpha_G$  are the weights placed on market, financial and non-financial measures of performance, respectively. The inclusion of  $F$  and  $G$  in the determination of managers' compensation has not only the benefit of providing a more concrete

---

<sup>1</sup> Conceptually,  $F$  and  $G$  are vectors of the financial and non-financial indexes of performance, respectively and  $\beta_1$  and  $\beta_2$  are vectors of the coefficients representing the sensitivity of stock prices to these indexes. To simplify the analysis and without loss of generality, the following discussion will treat each of them as a single variable.

measure of management's efforts to improve the financial and non-financial performance of the firm but also the advantage of reducing the effects of random factors  $\varepsilon_p$  on stock prices.

While a professional manager's personal income or wealth is closely connected with the level of compensation  $B$ , the wealth of a manager with substantive holdings of the firm's equity may depend more on the level of stock prices than on the level of compensation. By considering his equity ownership ( $\delta$ ), a manager's end of period wealth is the sum of  $B + \delta P$  whereas the residual value  $(1 - \delta)P - B$  is owned by outside shareholders<sup>2</sup>.

Assume the manager has a negative exponential utility function of wealth, and the costs incurred when he exerts efforts  $f$  and  $g$  to improve respectively the financial and non-financial performance is  $(1/2)(f^2 + g^2)$ . The financial and non-financial indicators of a firm's performance,  $F$  and  $G$ , are positively related to the manager's efforts,  $f$  and  $g$ . The relationships can be expressed as:

$$F = f + \varepsilon_F, \quad \varepsilon_F \sim N(0, \sigma_F^2) \quad (3)$$

$$G = g + \varepsilon_G, \quad \varepsilon_G \sim N(0, \sigma_G^2) \quad (4)$$

What concerns outside shareholders, who own  $1 - \delta$  of the firm's equity, is the design of a compensation plan (characterized by  $\alpha_0, \alpha_p, \alpha_F, \alpha_G$ ) which is able to maximize the expected residual value given the incentive compatibility and individual rationality constraints. Under the relationship between stock prices and various performance indicators expressed in equation (1), the linear form of compensation contracts specified in equation (2) and the assumption of a negative exponential utility function, the problem faced by outside shareholders can be formulated as:

---

<sup>2</sup> Strictly speaking, the stock price of a firm reflects the residual value of the firm, i.e.,  $P-B$ . The CEO's end of period wealth is thus the sum of  $B + \delta(P-B)$  and the value owned by outside shareholders is  $(1 - \delta)(P-B)$ . However, for publicly listed firms, CEO compensation is an extremely small part of the total firm value (less than 0.1%). We therefore neglect the term  $\delta B$  and let the wealth owned by the CEO and outside shareholders be  $B + \delta P$  and  $(1 - \delta)P - B$ , respectively.

$$\begin{aligned}
 & \text{Max}_{\alpha_0, \alpha_p, \alpha_F, \alpha_G} E[P - \delta P - (\alpha_0 + \alpha_p P + \alpha_F F + \alpha_G G)] \\
 \text{s.t. } & E[-\exp\{-r\{(\alpha_0 + \alpha_p P + \alpha_F F + \alpha_G G) + \delta P - \frac{f^2 + g^2}{2}\}\}] \geq u_0 \\
 & (f, g) \in \arg \max_{f, g} E[-\exp\{-r\{(\alpha_0 + \alpha_p P + \alpha_F F + \alpha_G G) + \delta P - \frac{f^2 + g^2}{2}\}\}]
 \end{aligned} \tag{5}$$

where  $r$  ( $r > 0$ ) denotes the risk aversion coefficient of the management. The expected utility of the management can thus be expressed as the agent certainty equivalent (ACE), calculated by subtracting the costs of efforts and risk premium from the expected compensation, that is

$$\begin{aligned}
 ACE = & \alpha_0 + (\alpha_p + \delta)[\beta_0 + \beta_1 f + \beta_2 g] + \alpha_F f + \alpha_G g - \frac{f^2 + g^2}{2} \\
 & - \frac{r}{2}(\alpha_p + \delta)^2 \sigma_p^2 - \frac{r}{2}\alpha_F^2 \sigma_F^2 - \frac{r}{2}\alpha_G^2 \sigma_G^2
 \end{aligned} \tag{6}$$

Assume further that shareholders are risk neutral, which implies the residual value is equal to shareholders' certainty equivalent. It follows that total certainty equivalent (TCE), the sum of management's and shareholders' certainty equivalents, can be expressed as

$$TCE = \beta_0 + \beta_1 f + \beta_2 g - \frac{f^2 + g^2}{2} - \frac{r}{2}(\alpha_p + \delta)^2 \sigma_p^2 - \frac{r}{2}\alpha_F^2 \sigma_F^2 - \frac{r}{2}\alpha_G^2 \sigma_G^2 \tag{7}$$

From the first order condition of ACE, the respective optimal amount of effort into financial and nonfinancial performance can be obtained:

$$f^* = (\alpha_p + \delta)\beta_1 + \alpha_F \tag{8}$$

$$g^* = (\alpha_p + \delta)\beta_2 + \alpha_G \tag{9}$$

As shown in equation (8), the optimal amount of effort devoted to improving financial performance is an increasing function of the weight placed on the financial measure of performance  $\alpha_F$  as well as the product of stock price sensitivity to financial performance  $\beta_1$  and the sum of the weight placed on the market measure of performance  $\alpha_p$  and management ownership  $\delta$ . In other words, a larger value of  $\alpha_F$ ,  $\beta_1$ ,  $\delta$ , or  $\alpha_p$  would result into a higher optimal level of managerial effort to improve financial performance. The optimal amount of managerial effort to improve nonfinancial performance depicted in equation (9) can be interpreted likewise.

The first constraint in equation (5) is referred to as the individual rationality constraint or the participation constraint and the second one is referred to as the incentive compatibility constraint. Following Hölmstrom and Milgrom (1991), the left-hand side of the rationality constraint is usually set to be equal to the right-hand side, i.e. the management (the agent) can only have reservation utility. By substituting management's response functions (8) and (9) into TCE, shareholders' problem can be reduced to an unconstrained optimization:

$$\begin{aligned} \text{Max}_{\alpha_p, \alpha_F, \alpha_G} & \beta_0 + \beta_1^2(\alpha_p + \delta) + \beta_1\alpha_F + \beta_2^2(\alpha_p + \delta) + \beta_2\alpha_G - \frac{(\beta_1(\alpha_p + \delta) + \alpha_F)^2 + (\beta_2(\alpha_p + \delta) + \alpha_G)^2}{2} \\ & - \frac{r}{2}(\alpha_p + \delta)^2\sigma_p^2 - \frac{r}{2}\alpha_F^2\sigma_F^2 - \frac{r}{2}\alpha_G^2\sigma_G^2 \end{aligned} \quad (10)$$

Differentiating equation (10) with respect to  $\alpha_p, \alpha_F,$  and  $\alpha_G,$  the first order condition yields

$$\alpha_p = \frac{\beta_1^2 + \beta_2^2 - \beta_1\alpha_F - \beta_2\alpha_G - \delta}{\beta_1^2 + \beta_2^2 + r\sigma_p^2} \quad (11)$$

$$\alpha_F = \frac{\beta_1(1 - \alpha_p - \delta)}{1 + r\sigma_F^2} \quad (12)$$

$$\alpha_G = \frac{\beta_2(1 - \alpha_p - \delta)}{1 + r\sigma_G^2} \quad (13)$$

By solving equations (11), (12) and (13) simultaneously, we can obtain the respective optimal weight placed on market, financial and nonfinancial measures of performance used in the compensation contracts:

$$\alpha_p^* = \frac{\beta_1^2 + \beta_2^2 - \frac{\beta_1^2}{(r\sigma_F^2 + 1)} - \frac{\beta_2^2}{(r\sigma_G^2 + 1)}}{\beta_1^2 + \beta_2^2 + r\sigma_p^2 - \frac{\beta_1^2}{(r\sigma_F^2 + 1)} - \frac{\beta_2^2}{(r\sigma_G^2 + 1)}} - \delta = \alpha_p' - \delta \quad (14)$$

$$\alpha_F^* = \frac{\beta_1}{r\sigma_F^2 + 1}(1 - \alpha_p') \geq 0 \quad (15)$$

$$\alpha_G^* = \frac{\beta_2}{r\sigma_G^2 + 1}(1 - \alpha_p') \geq 0 \quad (16)$$



$$\text{where } \alpha_p' = \frac{\beta_1^2 + \beta_2^2 - \frac{\beta_1^2}{(r\sigma_F^2 + 1)} - \frac{\beta_2^2}{(r\sigma_G^2 + 1)}}{\beta_1^2 + \beta_2^2 + r\sigma_p^2 - \frac{\beta_1^2}{(r\sigma_F^2 + 1)} - \frac{\beta_2^2}{(r\sigma_G^2 + 1)}} \quad (17)$$

Equation (17) indicates that  $0 < \alpha_p' < 1$ .  $\alpha_p^*$  in equation (14) is the derived optimal weight placed on market measure of performance,  $\alpha_F^*$  in equation (15) is the one on financial measure of performance and  $\alpha_G^*$  in equation (16) is the one on nonfinancial measure of performance. As shown in equation (14), The optimum weight placed on market measure of performance,  $\alpha_p^*$ , is negatively related to the measurement error of using market indicators to assess management' effort,  $\sigma_p^2$ , and the degree of manager's risk aversion,  $r$ . On the other hand, it is positively correlated with the sensitivity of stock price to financial and nonfinancial performance,  $\beta_1$  and  $\beta_2$ , and the measurement errors of these two indicators of performance,  $\sigma_F^2$  and  $\sigma_G^2$ . Likewise, the optimum weights assigned to financial and nonfinancial measures,  $\alpha_F^*$  and  $\alpha_G^*$ , are also negatively associated with the measurement errors of these two indicators of performance,  $\sigma_F^2$  and  $\sigma_G^2$ , respectively, but are both positively associated with the measurement error of market indicator of performance,  $\sigma_p^2$ .

Substituting the three optimal weights  $\alpha_p^*$ ,  $\alpha_F^*$ , and  $\alpha_G^*$  back into equations (8) and (9) yields the expected level of compensation and the respective optimal amount of managerial effort exerted to improve financial and nonfinancial performance. In the meantime, by substituting them back into equation (2), we obtain the following form of the optimal compensation:

$$B = \alpha_0 + (\alpha_p' - \delta)P + \gamma_F(1 - \alpha_p')F + \gamma_G(1 - \alpha_p')G \quad (18)$$

$$\text{where } \gamma_F = \frac{\beta_1}{r\sigma_F^2 + 1} \text{ and } \gamma_G = \frac{\beta_2}{r\sigma_G^2 + 1}.$$

Theorem 1 formalizes the impacts of CEO's shareholdings on the relationship between executive compensation and the three measures of performance.

*Theorem 1:*

Under the assumptions of a negative exponential utility function, a specific cost

function, and normally distributed stochastic errors, the optimum weights placed on market, financial and nonfinancial measures of performance are all positive when the CEO does not have any equity stake in the firm. Thus, the level of executive compensation is positively related to market, financial and nonfinancial measures of performance when the CEO has zero shareholdings. Nevertheless, with the increases in CEO's shareholdings, the optimal weight assigned to market measure of performance is decreasing and even becomes negative when  $\delta > \alpha'_p$ .

CEO's ownership affects negatively the sensitivity of the relationship between the level of executive compensation and the market measure of performance. As shown in equation (18), the positive association between executive compensation and market performance would become less substantive and the direction of the association even changes when managerial ownership is large enough. This can explain why empirical studies document evidence that market performance is the main determinant of CEO compensation for the U.S. corporations whereas the relationship between these two variables is generally rather weak and sometimes even negative for the Taiwanese firms.

The negative effect of managerial ownership on the relationship between executive compensation and market performance arises because the CEO's personal wealth depends on the level of compensation as well as the equity value of his holdings when he has equity stake in the firm. Hence, the compensation and the equity value of his holdings can be viewed as his portfolio and his objective is to maximize the certainty equivalent of this portfolio. When the CEO owns more shareholdings, the extent his personal wealth is subject to the variation of stock prices becomes larger. Accordingly, the optimal weight assigned to market measure of performance is decreasing in the CEO's ownership and even becomes negative if the CEO owns a substantial fraction of the equity shares. This theoretical finding is consistent with the empirical evidence of Allen (1981) and Lambert et al. (1993).

## **Empirical Analysis**

The model developed in Section 2 is aimed to answer the question: How to structure an effective incentive compensation contract? To understand the

relationships among executive compensation, ownership and firm performance in the real world, we will use the CEO compensation data for publicly held companies in Taiwan to conduct the empirical analysis. Based on the theoretical modeling, two parts of empirical analysis are involved: (1) examining the relationships between executive compensation and various measures of performance, (2) examining the effect of managerial ownership on the weight assigned to the market measure of performance after controlling for the effects of firm size and dual leadership.

As firm size and whether the CEO also holds the chairman's or the director's position, that is, dual leadership, can also affect the level of executive compensation, we will control for the effects of these two factors in conducting the empirical testing. In general, CEOs at larger firms receive higher compensation. Agarwal (1981) points out that the operation of large firms are more complicated and would require their CEOs to possess higher professional capability and assume more responsibility. Hence, compensation for CEOs at larger firms has to be higher to cover the extra costs incurred to the CEOs. Finkelstein and Hambrick (1988) argue larger firms pay higher compensation because their managers have to monitor many important resources, that is, compared with CEOs at smaller firms, the decisions made by CEOs at larger firms affect the firms' resources more pervasively.

As for the effect of dual leadership, the CEO can exert the control right to structure a high level of compensation unrelated to the firm performance when he also holds the position of chairman or director<sup>3</sup>. We propose in Section 2 that the portfolio effect of managerial ownership would affect the weight assigned to the market measure of performance. In addition to the portfolio effect, there is control right effect associated with managerial ownership. That is, when the CEO owns a high percentage of the equity shares, he is more likely to also hold the chairman's or the director's position and thus have more power in the corporate decisions. He may exert the control right to let the board structure the compensation contracts to his best advantages. Finkelstein and Hambrick (1989) document evidence that managerial

---

<sup>3</sup> As board of directors is the primary mechanism for monitoring managerial behavior, Article 29 of the Corporate Code in Taiwan requires a major vote for the appointment and discharge of CEO as well as executive compensation. Thus, when CEOs also hold the chairman's or the director's position, they have more influence in setting the compensation contracts. Dual leadership is quite common for the firms in Taiwan.

ownership affects the level of compensation, particularly the level of salary and bonus. In addition to a positive association between managerial ownership and the level of CEO compensation, Core, Holthausen, and Larcker (1999) find a negative relation between the compensation and subsequent firm value when the CEO has control right. Accordingly, we will control for the effects of firm size and dual leadership to examine the incremental effect of managerial ownership on the relationship between executive compensation and firm performance.

We will use both stock prices and stock returns to proxy for the market measure of performance, and earnings per share, return on assets, and return on equity to proxy for the financial measure of performance. As for the nonfinancial measure of performance, it is not easy to find a direct proxy. Good product quality, prompt delivery, short cycle of production and sale, and development of new product or service are all indicators of nonfinancial performance. However, it is very difficult to obtain data of these indicators and even if they are obtainable, they are not comparable across industries. Due to these difficulties, we can only employ relevant variables to indirectly proxy for nonfinancial measure of performance. In general, when a firm's nonfinancial performance is enhanced due to good product quality, prompt delivery, short cycle of production and sale, etc., the firm's customers will perceive higher satisfaction, which will in turn lead to higher sales volume. Thus, we will use the growth rate of sales revenue as the indirect proxy for nonfinancial measure of performance.

The definitions of these proxies for the three measures of performance are as follows:

1. Market measure of performance (P):

Stock price ( $P_r$ ): the year-end closing price of a firm's stock.

Stock return ( $R_p$ ): the annual stock return.

2. Financial measure of performance (F):

Earnings per share (EPS): net income after tax divided by number of shares outstanding.

Pre-tax return on assets (ROA): earnings before interest, depreciation, and tax

divided by average total assets.

Pre-tax return on equity (ROE): income before extraordinary items divided by average equity.

3. Nonfinancial measure of performance (G):

Growth rate of sales revenue (Gr): the difference of net sales between year t and year t-1 divided by the net sales at year t-1.

As executive compensation data are not available until 1996, the analysis is conducted for the period of 1996-1999. To be included in the sample, firms must meet the following criteria:

1. Firms must be publicly listed in the Taiwan Stock Exchange.
2. Firms changing trading method are excluded as they are usually under financial distress.
3. Stock price data for the first year when a firm is newly listed are excluded as there is usually abnormal price behavior during the newly listed period.
4. The cases of CEO tenure less than ten months or compensation less than six hundred thousand NT dollars are excluded.

All the data needed are collected from the databases provided by Taiwan Economic Journal. To conduct the test, we will first regress CEO compensation against the three measures of performance. Then, managerial ownership will be incorporated in the regression model to examine the effect of this factor on the relationship between executive compensation and market measure of performance. We will use dummy variables to represent if the managerial ownership is high or low. Thirdly, the effect of firm size will be controlled. Finally, the effects of firm size and dual leadership will be controlled together. The four regression models take the forms:

$$B_i = \alpha_0 + \alpha_1 P_i + \alpha_2 F_i + \alpha_3 G_i + \varepsilon_i \quad (19)$$

$$B_i = \alpha_0 + \alpha_1 P_i + \alpha_{11} D1 * P_i + \alpha_{12} D2 * P_i + \alpha_2 F_i + \alpha_3 G_i + \varepsilon_i \quad (20)$$

$$B_i = \alpha_0 + \alpha_1 P_i + \alpha_{11} D1 * P_i + \alpha_{12} D2 * P_i + \alpha_2 F_i + \alpha_3 G_i + \alpha_4 Size_i + \varepsilon_i \quad (21)$$

$$B_i = \alpha_0 + \alpha_1 P_i + \alpha_{11} D1 * P_i + \alpha_{12} D2 * P_i + \alpha_2 F_i + \alpha_3 G_i + \alpha_4 Size_i$$

$$+ \alpha_5 Dir_i + \alpha_6 Pre_i + \varepsilon_i \quad (22)$$

The definitions of the variables in the models are (the subscript *i* refers to firm *i*):

**B:** executive compensation, including salary, bonus, traffic allowances, and pay for directors.

**P:** market measure of performance, measured by either stock price (*Pr*) or stock return (*Rp*).

**F:** financial measure of performance, measured by EPS, ROA, or ROE.

**G:** nonfinancial measure of performance, measured by the growth rate of sales revenue.

**Size:** measured by the natural logarithm of total assets (*LnTA*) or shareholders' equity (*LnTE*) at the end of year *t-1*.

**Dir:** dummy variable, equal to 1 if the CEO is also a director; 0, otherwise.

**Pre:** dummy variable, equal to 1 if the CEO is also the board chair; 0, otherwise.

**D1:** dummy variable, equal to 1 if the CEO's ownership is between the 33<sup>rd</sup> and the 67<sup>th</sup> percentile, and 0 otherwise.

**D2:** dummy variable, equal to 1 if the CEO's ownership is larger than the 67<sup>th</sup> percentile; and 0 otherwise.

Note that data regarding executive compensation and the market measure of performance are of the same year while data regarding managerial ownership, financial and nonfinancial measures of performance are from the previous year<sup>4</sup>.

---

<sup>4</sup> As the financial data are settled and released at some time after the end of accounting period, this period's executive compensation is connected with last period's accounting numbers. We also conduct analysis with all the explanatory variables calculated from data of the same year as the compensation data, and the results are generally similar.

# Empirical Results

## 1.Descriptive Statistics

The descriptive statistics of the executive compensation and the explanatory variables for the sample firms are presented in Table 1. As shown, the CEOs of the sample firms receive, on average, around four million dollars but the range is rather wide<sup>5</sup>. The various performance variables also range wildly. The variable of annual stock returns, proxied for the market measure of performance, ranges from 347% to -97%, with a mean of 5.7%. Earnings per share, a proxy for the financial measure of performance, has a mean of 1.48 and a standard deviation of 2.19. The most profitable firm earns 31.97 dollars per share, while the worst firm loses 9.28 dollars per share. As the proxy for the nonfinancial measure of performance, the growth rate of sales ranges from 302% to -89.6%, with a mean of 12.37%. As for managerial ownership, half of the sample firms' CEOs own more than 1.43% of their firm's equity and the average ownership is 4.21%. Finally, more than two thirds of the CEOs also hold the position of director and about 20% also hold the position of board chair.

## 2.Empirical Findings

The regression results are presented in Tables 2 and 3, where the left and right columns of each panel are the regression results when the financial measure of performance is proxied by EPS and ROA, respectively. The regression results with the proxy of ROE are similar to those with ROA and thus are not shown to save space. Panels A and B of Table 2 show the regression results of equation (19) when stock price and stock return are used respectively as the proxy for the market measure of performance. The evidence presented in these two panels demonstrate that, without considering managerial ownership, the level of CEO compensation is highly related to the financial measure of performance, be it proxied by EPS, ROA or

---

<sup>5</sup> Morris Chang was for a very short period of time the chairman as well as the CEO of Taiwan Semiconductor Manufacturing Company Ltd and received more than one hundred million dollars. However, the CEO tenure of Morris Chang was rather short and thus is not included in our sample.

ROE. The effect of market measure of performance on the level of CEO compensation depends on the proxy used. When we use stock price (Pr) as the proxy, a positive association between executive compensation and market performance is revealed, and when we use stock return (Rp), the association becomes negative. Finally, the growth rate of sales revenue (Gr), the proxy for nonfinancial performance, is only weakly associated with the level of executive compensation.

**Table 1 Descriptive Statistics**

N=1187

Variables	Symbol	Mean	Median	Max.	Min.	Std. dev.
CEO Compensation (in thousands)	B	4151	3445	45303	632	3115
Stock Price (in dollar)	Pr	25.86	20.74	242.18	0.43	20.42
Stock Return (%)	Rp	5.70	-3.26	347.23	-97.17	50.44
Return on assets (%)	ROA	6.24	5.58	58.56	-36.91	6.90
Return on equity (%)	ROE	8.81	8.26	79.41	-78.07	11.63
Earnings per share (in dollar)	EPS	1.48	1.16	31.97	-9.28	2.19
Sales growth (%)	Gr	12.37	8.05	302.23	-89.6	28.14
Total assets (in Million)	TA	29103	7543	937000	648	76405
Total equity (in Million)	TE	9210	4582	133000	353	13899
CEO's ownership (%)	SP	4.22	1.43	65.01	0	6.77
CEO is also a director	Dir	0.69	1.00	1	0	0.46
CEO is also the board chair	Pre	0.18	0	1	0	0.39

Panel C of Table 2 presents the regression results of equation (20). By incorporating managerial ownership in the regression specification, the coefficients of stock price (not shown) and stock return (Rp) are all positive. As the dummy variables D1 and D2 both take the value of 0 when managerial ownership is lower than the 33<sup>rd</sup> percentile ( $\delta < 0.35\%$ ), the positive coefficients of Rp and Pr indicate that executive compensation is increasing in the market measure of performance when managerial ownership is low. Similar to the result in Panels A and B, the coefficient of sales growth remains insignificant. Furthermore, the negative coefficients of D1\*Rp and D2\*Rp imply that the weight placed on the market measure of performance is decreasing in managerial ownership. Particularly, as D2



takes the value of 1 when managerial ownership is higher than the 67<sup>th</sup> percentile ( $\delta > 4.03\%$ ), the significantly negative coefficient of  $D2*Rp$  for the model with EPS (and ROA) indicate for this group of CEOs, the weight placed on the market measure of performance is the sum of the coefficients of  $Rp$  and  $D2*Rp$ , which is negative ( $3.4 - 14.0 < 0$ ). Thus, consistent with the prediction of the model, the weight placed on the market measure of performance is negative when managerial ownership is large enough.

Table 3 presents the regression results of equations (21) and (22). After controlling for the effect of firm size, the results in Panel A of Table 3 are generally similar to those in Table 2. In particular, firm size is shown to have a large effect on the level of CEO compensation. Panel B of Table 3 presents the results after controlling for the effects of size and dual leadership together. As the indicator variables  $Dir$  and  $Pre$  take the value of 1 when the CEO is also a director and the chairman respectively, the significantly positive coefficients of these two variables reveal that the level of CEO compensation is higher when there is dual leadership. Furthermore, the compensation for a CEO being also the chairman is weakly larger than the compensation for a CEO also holding the position of director.

Overall, the empirical analysis provides evidence that the level of CEO compensation for the firms in Taiwan is mostly related to financial performance and firm size. Market and nonfinancial measures of performance have relatively small effects. In addition, when managerial ownership is low, executive compensation is positively associated with the three measures of performance. With the increases in managerial ownership, the coefficients of market measures of performance are decreasing and even become negative, which is consistent with the prediction of the model. As for nonfinancial measures of performance, the coefficients are generally insignificant, which may be due to sales growth being an inappropriate proxy. Finally, when CEOs also hold the chairman's or the director's position, they receive a higher level of compensation.

**Table 2 Regression results of the relationship among CEO compensation, ownership and firm performance**

Panel A : $B_i = \alpha_0 + \alpha_1 Pr_i + \alpha_2 F_i + \alpha_3 G_i + \varepsilon_i$							
EPS				ROA			
Variable	Coefficient	t-Statistic	Prob.	Variable	Coefficient	t-Statistic	Prob.
C	3108	24.05	0	C	2762	20.13	0
Pr	1.15	0.26	0.7949	Pr	12.31	2.77	0.0058
EPS	674.06	15.39	0	ROA	160.69	11.59	0
Gr	1.29	0.42	0.6712	Gr	5.48	1.75	0.0797
Adj. R <sup>2</sup>	0.2314	F-statistic	120.01	Adj. R <sup>2</sup>	0.1715	F-statistic	82.82
Panel B : $B_i = \alpha_0 + \alpha_1 Rp_i + \alpha_2 F_i + \alpha_3 G_i + \varepsilon_i$							
C	3115	32.06	0	C	2967	26.34	0
Rp	-3.10	-1.89	0.0595	Rp	-2.03	-1.18	0.2378
EPS	697.88	17.42	0	ROA	179.77	13.59	0
Gr	1.68	0.55	0.5806	Gr	5.98	1.90	0.0573
Adj. R <sup>2</sup>	0.2336	F-statistic	121.53	Adj. R <sup>2</sup>	0.1671	F-statistic	80.31
Panel C : $B_i = \alpha_0 + \alpha_1 P_i + \alpha_{11} D1 * P_i + \alpha_{12} D2 * P_i + \alpha_2 F_i + \alpha_3 G_i + \varepsilon_i$							
C	3110	32.14	0.0000	C	2964	26.33	0.0000
Rp	3.50	1.16	0.2443	Rp	3.23	1.03	0.3049
D1*Rp	-5.35	-1.37	0.1698	D1*Rp	-4.88	-1.20	0.2308
D2*Rp	-14.02	-3.47	0.0005	D2*Rp	-10.29	-2.45	0.0146
EPS	716.8	17.76	0.0000	ROA	182.6	13.73	0.0000
Gr	1.36	0.45	0.6546	Gr	5.93	1.89	0.0596
Adj. R <sup>2</sup>	0.2404	F-statistic	76.08	Adj. R <sup>2</sup>	0.1699	F-statistic	49.56

Note : N=1187 · B represents CEO compensation; P either stock return (Rp) or stock price (Pr) ; F is the financial measure of performance, proxied by EPS, ROE, or ROA ( The results with ROE are not shown as they are similar to the results of ROA) ; G is the nonfinancial measure of performance, proxied by the growth rate of sales (Gr) ; Size is measured by the natural logarithm of total assets (LnTA) and total equity (LnTE). The result with LnTE is essentially the same and is thus not shown. D1, D2 are indicator variables. D1 equals to one when managerial ownership is between the 33rd and 67<sup>th</sup> percentile, and zero otherwise. D2 equals to one when managerial ownership is larger than the 67<sup>th</sup> percentile, and zero otherwise.

**Table 3 Regression results of the relationship among CEO compensation, ownership and firm performance after controlling for the effects of size and dual leadership**

Panel A : $B_i = \alpha_0 + \alpha_1 P_i + \alpha_{11} D1 * P_i + \alpha_{12} D2 * P_i + \alpha_2 F_i + \alpha_3 G_i + \alpha_4 Size_i + \varepsilon_i$							
EPS				ROA			
Variable	Coefficient	t-Statistic	Prob.	Variable	Coefficient	t-Statistic	Prob.
C	-8088	-8.90	0.0000	C	-11578	-12.41	0.0000
Rp	4.25	1.50	0.1332	Rp	3.18	1.11	0.2668
D1*Rp	-4.56	-1.24	0.2135	D1*Rp	-3.54	-0.96	0.3396
D2*Rp	-10.67	-2.80	0.0052	D2*Rp	-7.14	-1.86	0.0630
EPS	674.4	17.68	0.0000	ROA	204.2	16.76	0.0000
Gr	0.91	0.32	0.7504	Gr	2.28	0.80	0.4265
LnTA	1627	12.38	0.0000	LnTA	2089	15.68	0.0000
Adj. R <sup>2</sup>	0.3272	F-statistic	97.13	Adj. R <sup>2</sup>	0.3125	F-statistic	90.86
Panel B : $B_i = \alpha_0 + \alpha_1 P_i + \alpha_{11} D1 * P_i + \alpha_{12} D2 * P_i + \alpha_2 F_i + \alpha_3 G_i + \alpha_4 Size_i + \alpha_5 Dir_i + \alpha_6 Pre_i + \varepsilon_i$							
C	-8848	-9.58	0.0000	C	-12383	-13.08	0.0000
Rp	3.94	1.40	0.1607	Rp	2.91	1.02	0.3066
D1*Rp	-3.87	-1.06	0.2891	D1*Rp	-2.75	-0.74	0.4566
D2*Rp	-11.04	-2.91	0.0037	D2*Rp	-7.70	-2.01	0.0442
EPS	671.7	17.73	0.0000	ROA	203.4	16.82	0.0000
Gr	0.91	0.32	0.7493	Gr	2.17	0.76	0.4467
LnTA	1620	12.22	0.0000	LnTA	2091	15.58	0.0000
Dir	881	3.89	0.0001	Dir	836	3.65	0.0003
Pre	1141	4.20	0.0000	Pre	1197	4.36	0.0000
Adj. R <sup>2</sup>	0.3370	F-statistic	76.36	Adj. R <sup>2</sup>	0.3227	F-statistic	71.64

Note : N=1187 · B represents CEO compensation; P either stock return (Rp) or stock price (Pr) ; F is the financial measure of performance, proxied by EPS, ROE, or ROA ( The results with ROE are not shown as they are similar to the results of ROA ) ; G is the nonfinancial measure of performance, proxied by the growth rate of sales (Gr) ; Size is measured by the natural logarithm of total assets (LnTA) and total equity (LnTE). The result with LnTE is essentially the same and is thus not shown. D1, D2 are indicator variables. D1 equals to one when managerial ownership is between the 33rd and 67<sup>th</sup> percentile, and zero otherwise. D2 equals to one when managerial ownership is larger than the 67<sup>th</sup> percentile, and zero otherwise. Pre (Dir) is an indicator variable equal to one when the CEO is also the chairman (director), and zero otherwise.

## Summary and Conclusions

This paper develops a theoretical model to clarify the roles of managerial ownership and various performance measures in the executive compensation contracts. The prediction of the model is tested with executive compensation data in 1996-1999 for the publicly listed firms in Taiwan. The theoretical analysis indicates that the optimum weights placed on market, financial and nonfinancial measures of performance are all positive when the CEO has very low equity stake in the firm. With the increases in managerial ownership, the optimum weight placed on market measure of performance is decreasing and even becomes negative. The analysis reveals that managerial ownership affects executive compensation through its influence on the optimum weight placed on the market measure of performance instead of being a direct explanatory variable of executive compensation.

The empirical evidence is generally consistent with the prediction of the model. Specifically, CEO compensation for the firms in Taiwan is mostly related to financial performance and firm size. In addition, when CEOs also hold the chairman's or the director's position, they receive a higher level of compensation. Furthermore, CEO compensation is positively related to the three measures of performance when managerial ownership is rather low. As managerial ownership gets larger, the coefficients of market indicators of performance are decreasing and even become negative.

This study focuses on the role of managerial ownership and does not consider the equity holdings of family owners. Future study can incorporate this factor and the characteristics of family holdings in the analysis. Moreover, managerial ownership can influence a firm's financing decision and hence affect the firm's performance, value, and risk. Further efforts can be directed toward examining the impacts of ownership and compensation contracting on capital structure, firm value, and risk.

## References

- Agarwal, N. 1981. Determinants of executive compensation, *Industrial Relations*, 36-46.
- Allen, M. P. 1981. Power and privilege in the large corporation: corporate control

- and managerial compensation, *American Journal of Sociology* 86, 1112-1123.
- Berle, Adolph A. and G. C. Means. 1932. *The Modern Corporate and Private Property*, New York: Macmillan.
- Cline, H. 1975. *Wage Determination of Executive Compensation*. Harvard Senior Honors Thesis.
- Core, J. E., R. W. Holthausen, and D. F. Larcker. 1999. Corporate governance, chief officer compensation, and firm performance. *Journal of Financial and Economics*, 51, 371-406.
- Frinkelstein, S. and D. C. Hambrick. 1988. Chief executive compensation: A synthesis and reconciliation. *Strategic Management Journal*, 9: 543-558.
- Fu, Chung-Jen and Bao-Guang Chang. 1998. Linear compensation contract under multi-efforts. *Taiwan Economic Association Annual Conference Proceedings*, 1988: 55-80.
- Healy, P.; 1985; The impact of bonus schemes on the selection of accounting principles. *Journal of Accounting and Economics*, (April): 85-107.
- Hill, C. W. and P. Phan. 1991. CEO tenure as a determinant of CEO pay, *Academic of Management Journal*, 34(3): 707-717.
- Hölmstrom, B. 1979. Moral hazard and observability. *Bell Journal of Economics*, 10: 74-91.
- Hölmstrom, B. and P. Milgrom. 1991. Multitask principal-agent analyses: Incentive contracts, asset ownership, and job design. *Journal of Law, Economics, and Organizations*, 7 (Supplement): 24-52.
- Jensen, M. C. and W. H. Meckling. 1976. Theory of the firm: Managerial behavior-agency cost and ownership structure. *Journal of Financial and Economics*, 3: 305-360.
- Lambert, R. A. and D.F. Larcker. 1987. An analysis of the use of accounting and market measures of performance in executive compensation contrasts. *Journal of Accounting Research*, 25: 85-125.
- Lambert, R. A., Larcker, D.F., and Weigelt, K. 1993. The use of accounting and security price measures of performance in managerial compensation contracts. *Journal of Accounting and Economics*, 16: 101-123.
- Mehran, H. 1995. Executive compensation structure, ownership, and firm performance. *Journal of Financial Economics*, 38: 163-184.
- Morck, R., Shleifer, A., Vishny, R. W. 1988. Management ownership and market valuation: An empirical analysis. *Journal of Financial Economics*, 20: 293-315.
- Ohlson, J.A. 1995. Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research*, 11: 661-687.
- Sloan, R. G. 1993. Accounting earnings and top executive compensation.

*Journal of Accounting and Economics*, 16: 55-100.

Yermack, D. 1996. Higher market valuation for firms with a small board of directors. *Journal of Financial Economics*, 40: 185-211.