EFFECTIVENESS OF COMBINING BONUS PLAN AND BALANCED SCORECARD

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ABSTRACT
This study uses an explicit function form to show how to construct an optimal compensation model by integrating the bonus plan and the balanced scorecard system. Model analysis shows the optimal bonus scheme for different tiers and departments with various characteristics. Meanwhile, it shows that the weight of stock granted in the compensation system would be lower when the performance evaluation system is well operated. It is particularly important to those non-listing companies or non-for-profit organizations, as the stock bonus become less necessary when managers’ effort can be well reflected by the performance evaluation system. The result can be served as a reference model to design better management system.

Key words: Bonus Plan, Balanced Scorecard, Performance Evaluation, Compensation design

I. Introduction
Both the bonus scheme and the stock grants system are effective management tools to attract and retain the outstanding executives and employees. Since the advocacy of Kaplan and Norton (1992, 1993), the Balance Scorecard (BSC) has become not only a main stream of performance evaluation but also an effective tool in assisting the implementation of organization strategies. The agency theory implies that executives incentive compensation and performance measurement system are endogenously determined. If we can integrate the bonus scheme and the balanced scorecard system effectively, then we can construct a better performance evaluation and compensation system feasible for both the profit and non-profit organizations.

Previous studies of managerial compensation focus on the incentives provided to chief executive officers (CEOs). Equity-based compensation, including stock options and with/without restricted stock award, has become an increasingly important component of executive compensation (Yermack 1995; Bryan et al., 2000; Kang, et al., 2006). An important issue is how to align incentives and responsibilities of managers with the objective of firm value maximization. Aggarwal and Samwick (2003) show that pay-for-performance incentives differ across executives according to their responsibilities and are structured to motivate managers, subject to the precision with which shareholders can measure each manager’s effort.

Traditionally, most companies employed financial performance measures to evaluate and reward managers (Eccles et al., 1992). Some firms would add market measures in the compensation contracts (Antle and Smith, 1986; Lambert and Larcker, 1987). Recent research shows that an increasing number of firms have incorporated nonfinancial measures such as quality, customer satisfaction, and market share into performance measurement and compensation plans (Ittner et al., 1997; Banker et al., 2000).
Firms that emphasize the short-term financial performance fail to link the long-term strategy with its short-term actions, causing a gap between strategy development and its implementation. The BSC complements the financial measures with non-financial measures, which in turn drives future financial performance. Thus, the BSC translates an organization’s strategic objectives into a comprehensive set of performance measures (Kaplan and Norton, 1992, 1993). The BSC has four major performance measures: the financial perspective, the customer perspective, the internal business process perspective, and the learning and growth perspective. By measuring performance from multiple perspectives, BSC could guard against short-term oriented and sub-optimized behaviors under the traditional financial measurement system. Although a growing number of firms have adapted balanced scorecards for compensation purpose, relatively little is known about the implementation issues associated with scorecard-based reward systems (Ittner et al. 2003). Particularly, McKenzie and Shilling (1998) suggest that a difficult decision is to assign weights to performance measures in a BSC. Empirical research shows that weights on multiple performance measures for incentive compensation are often based on subjective judgment (Krishnan et al. 2005). But Ittner et al. (2003) shows that the high level of subjectivity in the BSC plan could cause the system ultimately to be abandoned.

This research extends Holmström and Milgram (1991) and Fu et al. (2002) to integrate the BSC system into linear compensation contracting model. It shows how to integrate the multiple performance measures into a representative performance index for the listed company, with a guiding principle of bonus stock (or stock option) to executives in different tiers or different departments with the company. Consistent with Aggarwal and Samwick (2003), the model analysis indicates that compensation incentives vary across executives, according to their responsibilities and the degree of precision with which shareholders can measure the effort of managers. More importantly, we show that the weight of stock bonus plan in the entire compensation system could be reduced when the effort input of executives can be well reflected from the performance evaluation system. In contrast, the weight of stock bonus plan needs to be increased if the performance evaluation system fails to reflect the effort input of executives. This dynamic relation between bonus plan and performance evaluation system provides a new venue to examine the efficiency of the design and implication of firm compensation system.

The remainder of this paper proceeds as follows. Section II develops a theoretical model to show the linear relationship between executive’s compensation and multiple indicators of performance. Section III discusses the economic implications of model. We conclude in Section IV.

II. The Model

How to effectively integrate the optimal compensation contracting with the balanced scorecard in practice? According to the agency theory, shareholders design executive compensation contracts ex ante to minimize agency costs, after taking into account the impact of incentive compensation on managers’ self-interested behaviors. The optimal contracting framework suggests that performance measurement and compensation plan are endogenously and jointly determined in a second-best incentive arrangement. The early agency literature in accounting and economics provides little guidance about how performance signals could be combined in constructing an evaluation measure (Banker and Datar, 1989). We follow the linear contracting agency model studied by Holmstrom and Milgrom (1987, 1991) and use an explicit function form to show how
to integrate the bonus scheme and the balanced scorecard system.

Maximizing the wealth of shareholders is the major goal for the company, thus we can treat the firm value or the stock price as the representative of shareholders’ wealth. The firm value would be affected by (1) financial performance measures like book value and accounting earning; and (2) non-financial performance measures such as customer satisfaction, quality, delivery, and new product developments, etc. The firm value would be higher when the operating performance is better. Therefore, we can assume the relation of stock price with these elements as follow:

\[ P = c_0 + \alpha^T F + \gamma^T G + \varepsilon_p \]  \hspace{1cm} (1)

where \( P \) represents the price of stock, \( F \) represents financial performance measures vectors of \( m \) dimension, \( G \) represents non-financial performance measures vectors of \( n \) dimension, and \( c_0 \) is intercept, reflecting the effective results of other elements. \( \alpha \) and \( \gamma \) are the non-negative parameter vectors of \( m \) dimension and \( n \) dimension (represent the sensitivity of financial and nonfinancial performance). \( \varepsilon_p \) denotes random errors with \( N(0, \sigma_p^2) \). Equation (1) indicates that the expectation of stock price of an individual company is determined not only by financial performance, but also non-financial performances (under BSC these non-financial performances include the customer perspective, the internal business process perspective, and the learning and growth perspective).

To successfully align the interest of management team (or employee) with the stockholders, the stockholders should design the performance evaluation and compensation system in such a way that reflects the relation denoted in Equation (1). Such a compensation system could eliminate the influence of uncertainty and lower the cost of agent. Thus, the compensation contract can be represented as the equation below:

\[ B = d_0 + d_p P + \beta^T F + \delta^T G \] \hspace{1cm} (2)

where \( B \) represents the compensation benefit of executives, \( d_0 \) denotes fixed portion of compensation, \( d_p \) denotes a parameter or a weight placed on stock price, and \( \beta \) and \( \delta \) are the parameter vectors of \( m \) dimension and \( n \) dimension. Equation (2) includes \( P \) as one of the determining factors of managers’ compensation. As in the same spirit of Lambert and Larcker (1987), the inclusion of \( P \) can help measure the effort and performance of agents from financial and nonfinancial aspects more specifically and control the influence of non-corporation elements that are brought into \( F \) and \( G \), the increased portion information.

Assume the agent has negative exponential utility function, and as for the agent, his effort on financial performance \( (f) \) and effort on nonfinancial performances \( (g) \), the total cost of effort is \((1/2) (f^T f + g^T g)\). The performance of financial and nonfinancial aspects of corporations \((F \text{ and } G)\) closely relates to the effort of agents \((f \text{ and } g)\). We assume the relationship among them as follow:

\[ F = f + \varepsilon_F \ \text{and} \ \varepsilon_F \sim N_m(\theta_m, V) \]  \hspace{1cm} (3)
\[ G = g + \varepsilon_G \ \text{and} \ \varepsilon_G \sim N_n(\theta_n, W) \]  \hspace{1cm} (4)

where \( \theta_m \) and \( \theta_n \) represent the null vector of \( m \) dimension and \( n \) dimension, \( V, W \) are the covariance matrix of \( m \) dimension vector \( \varepsilon_F \) and \( n \) dimension vector \( \varepsilon_G \). Generally, although it indicates a positive relation with \( F \) and \( G \), the relationship among measure errors are not actually related. We assume that \( V, W \) and \( \sigma_p^2 \) are all independent in this study.
Meanwhile, the shareholders’ key issue is to determine a compensation plan \((d_0, d_p, \beta, \delta)\) that maximizes the expected residual under the incentive compatibility (IC) and individual rationality (IR) constraints. Under the linear compensation contracting, and the assumptions of manager’s negative exponential utility function and normal distribution, we formulate the shareholders’ issue as follows:

\[
\begin{align*}
\max_{d_0, d_p, \beta, \delta} E[P - (d_0 + d_p P + \beta^T F + \delta^T G)] \\
\text{s.t.} \quad E[- \exp\{ -r\{ (d_0 + d_p P + \beta^T F + \delta^T G) - \frac{f^T f + g^T g}{2} \} \} \} \geq u_0
\end{align*}
\]

where \(r > 0\) represents the manager’s risk aversion coefficient, \(f\) and \(g\) denote the feasible levels of \(f\) and \(g\), respectively.

We assume that shareholders are risk neutral. Following the standard first order condition and backward induction method, the optimal weights assigned to the market, financial and non-financial performance measures, and the optimal agent’s level of effort in financial and nonfinancial performance are obtained as follow:

\[
\begin{align*}
d_p^* &= \frac{C + D}{C + D + r\sigma_p^2} \\
\beta^* &= \frac{\alpha}{1 + r\gamma} \frac{r\sigma_p^2}{C + D + r\sigma_p^2} \\
\delta^* &= \frac{\gamma}{1 + r\gamma} \frac{r\sigma_p^2}{C + D + r\sigma_p^2} \\
\beta^* &= \frac{\alpha}{1 + r\gamma} \frac{C + D}{C + D + r\sigma_p^2} \\
g^* &= \frac{\gamma}{1 + r\gamma} \frac{C + D}{C + D + r\sigma_p^2}
\end{align*}
\]

where \(C = \frac{a^T a rV}{1 + rV} \quad D = \frac{\gamma^T \gamma rW}{1 + rW}\).

From the analysis above, we have the following proposition:

**Proposition:**

Under the assumptions of specific utility function and cost function, the optimal weight of market performance measure \((d_p^*)\) in compensation contract (1) is negatively associated with its variation(\(\sigma_p^2\)) and manager’s risk aversion (\(r\)); and (2) is positively related with the sensitivity of financial and non-financial performance(\(\alpha\) and \(\gamma\)); and (3) is positively associated with the measure error of manager’s level of effort (\(V\) and \(W\)). When the financial and non-financial performance measures are informative, the optimal weight of financial (non-financial) performance measure \(\beta, \delta\) is (1) negatively associated with its measure error \(V(W)\), and (2)
positively related with the sensitivity of financial (non-financial) performance $\alpha$ ($\gamma$), and (3) positively associated with the measure error of manager’s non-financial (financial) effort $W$ ($V$). And both these two coefficients are positively associated with the variation ($\sigma^2_p$) of market performance measurement.

III. Economic Implications

We obtain the following corollaries related to the measurement coefficients, $d_p^*$, $\beta^*$, and $\delta^*$:

**Corollary 1:** When an organization or a company has no market performance measure, then $\sigma^2_p$ $\rightarrow$ $\infty$. Under this condition we have $d_p^* = 0$, $\beta^* \rightarrow \frac{\alpha}{1 + rV} \equiv \beta^*$, $\delta^* \rightarrow \frac{\gamma}{1 + rW} \equiv \delta^*$. Then equation (2) will reduce to $B = d_0 + \beta^T F + \delta^T G$.

This indicates that setting financial and multiple non-financial performance measures as the basis of compensation is appropriate when a company has no market performance measure (such as a non-listing company or a non-profit organization) or has very high measure errors of its market performance measure to evaluate the effort that executives or departments give.

**Corollary 2:** For those companies the stock market performance provides a near-perfect measure, then $\sigma^2_p$ $\rightarrow$ $0$, $d_p^* \rightarrow 1$, $\beta^* \rightarrow 0$, $\delta^* \rightarrow 0$. All coefficients of financial and non-financial performance measures are approaching to zero, simple because the market price is sufficient statistic of these measures. Then equation (2) reduces to $B = d_0 + d_p P$ (indeed $d_p^* \rightarrow 1$), which is consistent with Homlström (1979) when the additional signals are not informative.

**Corollary 3:** For $\sigma^2_p > 0$, $d_p^* < 1$, $\beta^* > 0$, $\delta^* > 0$, these two coefficient vectors of additional information $F$ and $G$ are positive when perfect observation of agent’s action is precluded ($V$ and $W$ are positive). Both the financial and non-financial performance measures are informative. The relative weights of financial and non-financial performance measures will depend on the sensitivity ($\alpha$ and $\gamma$) and its measure error ($V$ and $W$). The larger values of $\alpha$ to $\gamma$ and $W$ to $V$, the more sensitive $B$ to $F$.

For example, for senior managers with much controlling power, the measure error of financial performance factors is relatively less. Therefore, the weight of financial measure for these senior managers should be higher. On the other hand, the middle-level managers have less controlling power, so the non-financial performance measure would reflect more effort they put to the organizations. The measure error will be less than the nonfinancial measures can decide the compensation mainly.

Furthermore, under BSC structure we can decompose the nonfinancial measurement vector into customer (C), internal process (IP), and the learning/growth (LG) perspectives. The relative weights of different nonfinancial performance measures ($\delta_c, \delta_p, \delta_{LG}$) are different across the departments with various controlling power and responsibilities.
Corollary 4: With the different characteristic of department, the weights of non-financial performance measures should be different. Take sales department as an example. The weights of customer perspective measure ($\delta_c$) will be higher than internal process perspective ($\delta_P$). This is because the sensitivity of customer perspective measure ($\gamma_c$) is relative higher than internal process perspective ($\gamma_P$) in sales department.

When an organization implements the balance scorecard system, it can help decrease the measure error of non-financial performance measure, in addition to increasing the non-financial performance measure systematically. As indicated from the equation (8), the optimal weight ($\delta$) of non-financial performance measure will increase and consequently, lower the weight of market performance measure. With the continuous improvement through balance scorecard, the organization can reduce its measure error of non-financial and measure cost gradually.

Corollary 5: When a company’s BSC system is functioning well, the non-financial performance measure can be a good substitute for the market performance measure; or a well-functioned BSC system can help decrease the need of stock bonus plan.

Different departments should set up their own optimal weight of performance measure. A more efficient compensation plan can help lower the loss of the departure of key employees because of the high price of stock granted. The analysis of model shows that optimal weight of performance measure can be different from the departments. The non-financial and market performance measures can be lower or even eliminated if a department or an executive can be measured through the financial performance measures particularly in short-term. The traditional compensation contract is suitable enough. On the other hand, when a department or an executive is not easy to measure with short-term financial indicators, then multiple non-financial performance measure of BSC or market performance indicator is a good candidate.

Corollary 6: The weight of market performance measure will be low and even could be eliminated if the non-financial performance measure works efficiently, as for the middle and low level of executives. The measure error is very high for their efforts to the market performance measures, thus the $d_m$ should be lower, $\beta$ and $\delta$ should be higher. In contrast, an organization could consider the bonus stock plan if the efforts of executives or employees can not be well evaluated in the short-time, such as the R&D employees or managers of a new department.

IV. Conclusions and Suggestions

Both stock granted and BSC systems have been widely used to motivate senior managers and employees. BSC can encourage executives to achieve the goal of organization by applying the multiple non-financial performance measures. Although the cost of implementing BSC is high, it benefits the firm in the long-term. The balanced scorecard, bonus and stock granted are the important tools of compensation design and incentive system. This study uses an explicit function model to show the effectiveness of integrating the balanced scorecard system with the bonus scheme to construct a better compensation structure. The results can be served as a reference model to design better management system.

References available upon request from Chung-Jen Fu