

Equity-based Executive Compensation Plan and Firm Performance: A Residual Income Approach

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H. Young Baek

Wayne Huizenga Graduate School of Business
Nova Southeastern University
3100 SW 9th Ave.
Fort Lauderdale, FL 33315
Phone: 954) 262-5103
E-mail: hybaek@nova.edu.

and

Joung W. Kim

Department of Accountancy
John Molson School of Business
Concordia University
1455 de Maisonneuve Blvd., West
GM 600-3, Montreal, Quebec,
Canada H3G 1M8
Phone: 514) 848-2760
E-mail: jkim@jmsb.concordia.ca

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ABSTRACT

We do not find evidence of association between firm performance and level of equity-based compensation plan. Contrary to the norm in practice that equity-based compensation would increase shareholders' wealth, our results show that the performance has not been improved over the period of 1995 to 1998 and that average performance during the period may be negative after controlling for the cost of equity and the cost of stock option value granted to top five executives. Also we find that although the firms who have higher level of equity-based compensation plan show a significantly higher performance measured by return on asset (ROA), the significance disappears when we employ the different performance measures such as residual income (RI: after-tax operating profits before the after-tax interest expense, less a charge for the capital) and net RI (RI minus value of stock options granted to top five executives measured by the modified Black-Scholes model). Overall, our study questions the effectiveness and efficiency of equity-based compensation plan in terms of shareholders' interests.

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1. Introduction

Recently, the number of chief executive officers (CEO) receiving incentive compensation has increased rapidly and the weight of management stock option (MSO) among corporate CEO compensation has grown tremendously. According to Blasi, Kruse, Sesil and Kroumova (2000), a Standard & Poor's COMPUSTAT study of executive compensation at the 365 largest companies in the U.S. in 1998 find that stock options made up 80% of the average CEO pay package. To investigate whether there is an association between the level of executive equity-based compensation (EEC hereafter) and the corporate performance, this study extends the prior studies by employing a different performance measure with more recent data. The prior studies such as Mehran (1995), Core, Holthausen, and Larcker (1999), and Abowd (1990) have employed long-term stock return, accounting earnings, Tobin's Q and abnormal return around the filing date of proxy statement to measure firm's performance. The current study discusses the potential problems of those measures and employ residual income (RI) as firm's performance measure. Then, using the RI (after-tax operating profits before the after-tax interest expense, less a charge for the capital) and net RI (RI minus executive stock option value estimated by the modified Black-Scholes model), the study provides an implication regarding whether top managers have been overpaid through equity-based compensation plan compared with their performance.

The current study finds that contrary to the norm in practice that equity-based compensation would increase shareholders' wealth, the performance has not been improved over the period of 1995 to 1998 and that average performance during the period is negative after controlling for the cost of equity and the value of stock options granted to top five executives. We also find that although the firms with higher level of equity-based compensation plan show a significantly higher performance measured by return on asset (ROA), the significance disappears when we employ the different performance measures such as RI and Net RI.

The remainder of this paper is organized as follows. In the next section, we review the prior empirical literature on association between firm performance and level of equity-based compensation plan. The research design and results are presented and discussed in Section 3. A summary and conclusion is provided in Section 4.

2. Literature Review

Many studies have investigated the motivations for the executive equity-based compensation plan adoptions. Yermack (1995) empirically tested several motivations for EEC and supported three types of hypotheses. First, companies in highly regulated industries are less likely to use EEC as a source of managerial incentive. Second, firms provide their CEOs with greater incentives through EEC when accounting earnings contain large amounts of noise. Third, corporations facing internal liquidity problems shift the mix of executive pay away from cash salaries and bonuses and toward stock options.


A prevailing rationale for the EEC plan adoption is to reduce the agency conflicts between shareholders and managers. The empirical results from the prior studies, however, do not lead to a conclusive answer to the effectiveness of the EEC plans. Brickly, Bhagat and Lease (1985), Mehran (1995), and Hall and Liebman (1998) find that there is a positive relationship between the percentage of equity-based compensation held by CEOs and firm performance in the market. For 39 firms in the aerospace, chemical and electronics industries, Masson (1971) also find weak evidence that higher sensitivity firms perform better in subsequent periods. On the contrary, Jensen and Murphy (1990) and Gompers and Lerner (1999) do not find a significant positive relationship. Accordingly, Hallock and Murphy (1999) conclude in their review of literature that there is little evidence that high pay-performance sensitivity leads to higher subsequent company performance.

Some early studies examine the contemporaneous relationships between pay and performance measured by stock returns. Using data for five hundred executives from 75 of the largest U.S. manufacturing firms over the 1964-1981 period, Murphy (1985) finds a statistically significant relationship (albeit small) between total compensation level and stock performance. The result indicates

that a firm realizing a 10% rate of return will increase the total remuneration of an executive by 2.1%.

Gibbons and Murphy (1990) also find that CEO salary and bonus is positively related to stock return, but negatively related to industry performance. Jensen and Murphy (1990) also find the relationship between executive wealth change and shareholder wealth change statistically significant but economically insignificant.

Direct investigations of the relationship between pay and Tobin's Q ratio also exist. In a comprehensive study of firm performance using 1979-1980 compensation data for 153 randomly selected manufacturing firms, Mehran (1995) finds that performance, as measured by Tobin's Q and ROA, is positively related to the proportion of equity-based compensation, management ownership of stocks and options, and research and development expenses over sales. Core, Holthausen and Larcker (1999) find for 205 public U.S. firms during 1982-1984 that the average ROA (1, 3, or 5 years) and stock returns are negatively related to the 'predicted excess compensation,' which are controlled by stock ownership and board of directors' variables. Ke, Petroni and Safieddine (1999) also find that ROA and level of compensation is positively related only for the publicly-held insurance companies.

In the prior studies, three main types of performance measures have been used: long-term stock return or Tobin's Q, accounting-based return like ROA, and abnormal return around proxy statement filing date. Long-term holding return and Tobin's Q do not consider cost of equity capital. Because equity capital is not free, the cost of equity should be deducted from the gross return when the effect of EEC on shareholders' wealth is measured. Even if there is an increase of gross return like long-term holding return, the shareholders' wealth is decreased if the increase of the gross return is less than cost of equity capital. In a recent clinical study for the Ralston Purina Company's 1986 executive stock grant plan, Campbell and Wasley (1999) document that the company set up the hurdle rate of return  lower than its cost of capital and its stock-based incentive compensation contracts fail to adequately motivate its top managers. The potential misuse of EEC programs is also suggested by Yermack (1997), who finds an indirect evidence that managers have influence over the decision-making procedure of stock option plans and adopt more performance-based pay plans in advance of anticipated stock price increases. In all, the

empirical studies on the effectiveness of EEC plans are far from conclusions despite strong predictions from agency theories.

Although studies like Abowd (1990) find positive abnormal returns (AR) around performance-based pay adoption, two issues also arise with this type of event study analyses. First, the identification of event dates is ambiguous. Second, even if one pinpoints the exact event date and finds a positive abnormal return, the finding is consistent with two different hypotheses. A positive abnormal return may mean some reduction in agency costs through better alignment of incentives, but it may also mean that top executives are able to time the events or the announcements of ‘good’ news (Yermack, 1997).

In order to extend this literature, we employ the RI measure, which is an operating income before interest expense minus cost of capital, and net RI, which is the RI minus the value of executive stock options, to measure firm performance. Shareholders always expect the return of at least the cost of equity capital. Although Campbell and Wasley (1999) show the importance to distinguish the excess performance, which is one of the main purpose of executive compensation adoption, from the realized nominal performance observed in the market, the previous studies fail to provide the evidence on the relationship between top management compensation and excess firm performance. More importantly, we investigate whether the firms that adopt more equity-based compensation plan perform better in terms of the net residual income.

3. Research Design and Empirical Results

3.1 Residual income, net residual income, and other variables

In terms of considering cost of equity capital, RI is supposed to be a better proxy for performance. First, we examine whether there is a change between when ROA is used as the performance measure and when RI or Net RI is used as the performance measure. ROA is calculated operating income after depreciation divided by total assets. Second, two different portfolios are created based on the level of EEC, and ROA, RI, and Net RI are compared between the two portfolios.

We use the Standard & Poor's *ExecuComp* database, which includes top-five executives' compensation information for each of S&P 1500 companies for calendar years 1995 to 1999. By combining S&P 500, Mid-Cap 400 and Small-Cap 600, the S&P Super Composite 1500 Index represents 87% of the total U.S. equity market capitalization. Firm's cost of capital for the recent years are available from the www.stockbasics.com site. After deleting observations with missing values in Compustat or Stockbasics.com, we have a final sample of 1146 firm-year observations.

Ordinary Least Squares (OLS) regression model is used to investigate the relation between firm performance and level of EEC. We employ the three different dependent variables: accounting income (ROA), RI divided by total assets (RI/TA), and net RI divided by total assets (Net RI/TA). As Campbell and Wasley (1999) suggested, we attempt to measure the firm performance after considering the cost of equity capital, and use the residual income to calculate the change in shareholder wealth. Residual income (RI) is generally defined as after-tax operating profits before the after-tax interest expense, less a charge for the capital. Biddle et al. (1997) describe linkages between earnings before extraordinary items (EBEI), Net operating profits after tax (NOPAT), and residual income (RI). Considering the explanation of Biddle et al. (1997), we define the residual income as follows:

$$RI = NOPAT - (k * \text{Average Capital Invested}) \quad (1)$$

Where k is Stockbasics.com's estimate of the firm's weighted average cost of capital¹, Average Capital Invested is defined by Stockbasics.com as the sum of all cash invested as borrowings or equity.

Borrowings include all forms of debt, capital leases, present value of operating leases, debt-equivalent securities, and equity includes investments by shareholders, retained earnings and related items as well as

¹ To estimate the weighted average cost of capital, Stockbasics.com employs the following three components: cost of equity and equity equivalents, cost of borrowings, and cost of preferred stock. The cost of equity capital is estimated using the Capital Asset Pricing Model with one additional adjustment for the size of the company. The cost of borrowings and the cost of preferred stock are estimated based on the market capitalization of companies (see the appendix A for details).

equity equivalents: deferred taxes, and various reserves such as LIFO reserves, capitalized R&D expenditures, bad debt reserves, etc,

$$\text{NOPAT} = \text{EBEI} + \text{ATInt} \quad (2)$$

Where ATInt is the after-tax equivalent of book interest expense. We calculate 'Net RI' to investigate the efficiency of the stock option plan as follows: $\text{Net RI} = \text{RI} - \text{Option value}$ measured the modified Black and Scholes (1973).

=== *Insert Figure 1 around here* ===

Figure 1 shows a moving pattern over time of ROA, RI/TA, and Net RI/TA. Comparing all three performance measures, we find that ROA is significantly positive for all test periods, while RI/TA and Net RI/TA are negative, but are not statistically significant.² This result implies that the shareholders' wealth, on average, has not been increased when the cost of equity capital is controlled for. More surprisingly, although ROA has been increased during 1998-1999 period, RI/TA and Net RI/TA have been decreased. During the period of 1996 to 1999, the accounting income of those sample firms is less than the cost of equity even if the firms show a big increase in ROA. This figure questions whether EEC is an effective tool to motivate the executives to act in favor of shareholders' wealth.

=== *Insert Table 1 around here* ===

Considering the variables employed in the prior studies by Mehran (1995) and Jensen and Murphy (1990), we also use the following four independent variables to investigate relation between firm

² One-tail t test is performed

performance and level of EEC: S/TC, B/TC, EEC/TC and MSO. S/TC is the dollar value of cash or non-cash base salary earned by top 5 executives divided by total compensation earned by top 5 executives. B/TC is the dollar value of bonus earned by top 5 executives divided by total compensation earned by top 5 executives. EEC/TC is the dollar value of equity-based executive compensation (restricted stock granted value plus the value of granted option measured by the modified Black-Scholes model) earned by top 5 executives divided by total compensation earned by top 5 executives, and MSO is the aggregate share ownership % by top 5 executives.

Table 1 presents descriptive statistic for the variables employed in the study and industry distribution of sample firms. Aggregate salaries to top five executives range from 0 to 109% of total compensation to those executives, and aggregate bonuses range from 0 to 81%. On average, salary (S/TC) and bonus (B/TC) to top five executives of our sample firms amount to 29% and 17% of total compensation, respectively. Equity-based executive compensation to top five managers is on average 38% of aggregate total compensation, and ranges from .1% to 99%. The average stock ownership by top five executives is 11.8%, but the range is wide from .01% to 100%. Average operating income, residual income and net residual income are 317, -52 and -60 million dollars, respectively, and they amount to 8.6%, -1.3% and -2.2% of total assets, respectively. The largest industry in our sample is retail industry with 31% of observations, followed by software with 21%, utility with 13%, healthcare with 9%, entertainment with 8.6% and transportation with 7.6%.

3.2 Comparison of the regression models

Using the following regression models, we investigate if the coefficient estimates for each independent variable when different measures of performance are employed: ROA, RI/TA and Net RI/TA:

$$PERF_i = \alpha_i + \beta_1 (S/TC)_i + \beta_2 (B/TC)_i + \beta_3 (EEC/TC)_i + \beta_4 MSO_i + \varepsilon_i, \quad (3)$$

where $PERF_i$ is the firm i 's performance measure such as ROA, RI/TC and Net RI/TC, and $(S/TC)_i$, $(B/TC)_i$, $(EEC/TC)_i$ and MSO_i are dollar value of salaries divided by total compensation, dollar value of bonus divided by total compensation, dollar value of equity-based compensation divided by total compensation and percentage share ownership by top five executives in firm i .

=== *Insert Table 2 around here* ===

Table 2 provides the regression results. Comparing R squares of three models, RI/TA and Net RI/TA models show higher R squares than ROA model (we do not test this). As agency theories predicted, B/TC (bonus as a fraction of total compensation) and MSO (management stock ownership) are significantly positively related to performance in all three models. One very interesting result, however, is that the coefficients for EEC/TC variable (equity-based executive compensation as a fraction of total compensation) are not statistically significant in any of three models. In other words, we fail to find evidence for the relationship between the level of equity-based executive compensation and corporate performance measured by net income, residual income, and the net residual income normalized by total assets and controlled for industry effects. While salary is expected to have no relationship with performance, a negative relationship between S/TC and ROA is hard to explain. We also perform F-tests to see if the coefficient estimates are different across the regression models, and we do not find evidence of such changes.

3.3 Comparison of Performance between High and Low EEC Portfolios

Next, we establish two portfolios according to the level of EEC as a fraction of total compensation: high EEC and low EEC. In each sample year, firms are ranked based on the fractional EEC, and firms in top 40% are assigned to high EEC portfolio and bottom 40% firms are assigned to low EEC portfolio.

=== *Insert figure 2 around here* ===

Figure 2 shows the average performance measured by ROA, RI/TA and Net RI/TA. Although high EEC portfolio shows a higher average ROA (9.51%) than low EEC portfolio (7.39%), the average performances measured by RI/TA (-1.85% vs. -1.21%) and net RI/TA (-2.27% vs. -2.61%) do not show big differences.

=== *Insert Table 3 around here* ===

Table 3 provides the results of t-tests to compare the average performance measures of two portfolios. The results that high EEC portfolio shows the significantly higher average performance than low EEC portfolio when ROA is used as the performance measure is consistent with the existing literature. However, when cost of equity is deducted from performance measure, the difference in performance is not statistically significant any more. Especially when the value of options granted to executives is subtracted from performance, the high EEC portfolio even shows a lower average net RI/TA than low EEC portfolio. According to these results and insignificant coefficients for EEC/TA from the regressions in Table 2, we come to a conclusion that the practice of high equity-based executive compensation during the period of 1995 to 1999 did not lead to an improvement in corporate performance. It implies that equity-based compensation plan does not increase shareholders' wealth if the cost of equity and the cost of stock option value granted to top executives are recognized.

4. Concluding Remarks

During the 1995-1999 period, the U.S. stock market has grown so fast and numerous companies adopted stock option plans to their executives, believing that their adoption would affect top managers' behavior and increase the shareholders' wealth. However, our study provides the evidence that is not consistent with the belief that was prevailing at that time. This study documents for a large sample of the

U.S. firms during the late 1990s that corporate performance did not improve as much as it appeared when the cost of equity capital and the value of stock options granted to top executives are considered. Our results question the effectiveness of equity-based compensation plan. We do not find evidence for a positive association between the level of equity-based compensation as a fraction of total compensation and performance when equity costs and executive stock option costs are controlled for.

Although this study provides very interesting insights to the adoption of stock option plans, a few adjustments may improve the current study. To avoid a potential causal effect from performance to compensation policies, one can employ the performance in subsequent periods rather than contemporaneous ones. Also, the use of long-term performance measures beyond the year of compensation payment should improve to measure the performance after equity-based compensation is paid.

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Appendix. Estimation of the Cost of Borrowings and the Cost of Preferred Stock

The estimation is performed based on the market capitalization with the following tables

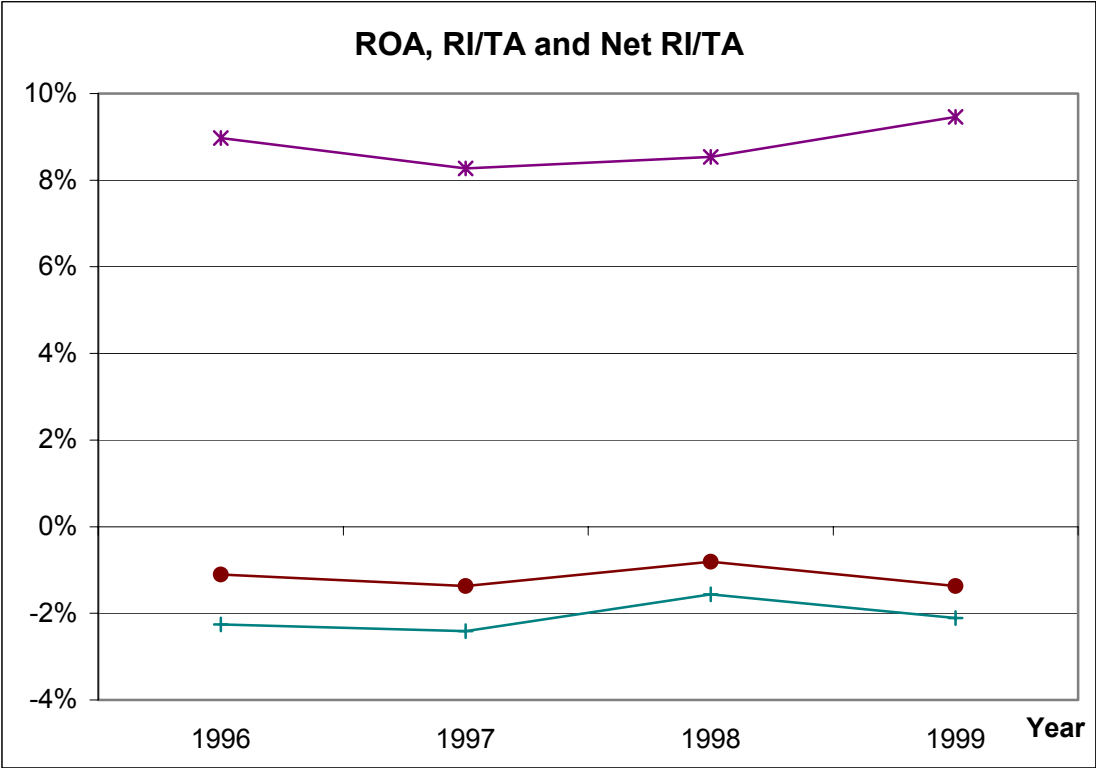
A. Cost of Borrowings:

Market Capitalization	Millions	Rates used
33% large-cap	\$599 +	AAA bond rates
33% mid-cap	\$78 to \$599	BAA bond rates
33% small-cap	&0 to \$78	Prime rates

B. Cost of Preferred Stock

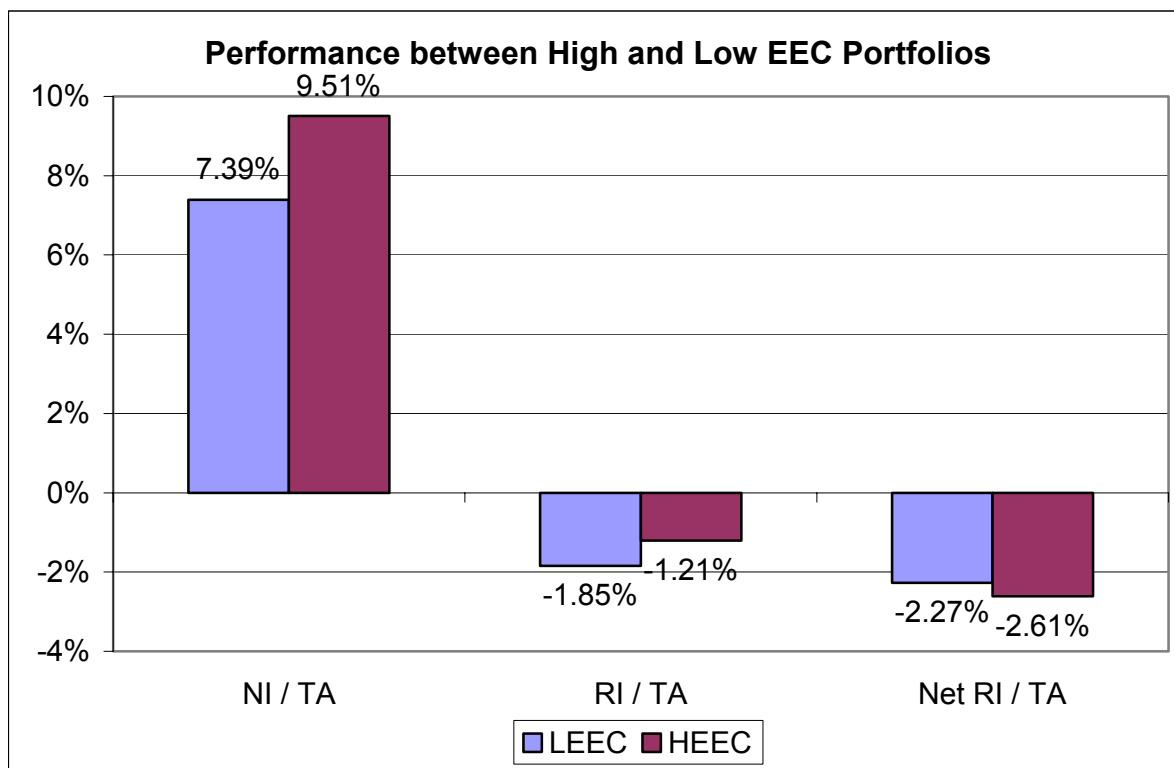
Market capitalization	Millions	Rates used
50% large-cap	\$208 +	AAA bond rates
50% small-cap	\$0 to \$208	BAA bond rates

Figure 1. Time Trend of ROA, RI/TA and Net RI/TA



*, ● and + represent ROA (operating income divided by total assets), residual income / total assets and net residual income / total assets, respectively.

Figure 2. Average Performance of High and Low Equity-based Executive Compensation Portfolios



Sample firms are ranked by equity-based executive compensation (EEC) and top 40 % firms are assigned to High EEC portfolio while bottom 40% firms are assigned to Low EEC portfolio. Average performance measures of high and low EEC portfolios are presented in graph.

Table 1. Descriptive Statistics and Industry Distribution of the Sample**A. Descriptive Statistics**

Variable	Minimum	Maximum	Mean	Std. Dev.
S/TC	0	1.0947	0.2928	0.1953
B/TC	0	0.8121	0.1678	0.1334
EEC/TC	0.0011	0.9895	0.3809	0.2073
MSO	0.01%	101.40%	11.78%	16.35%
OI (\$ mil.)	-2,585.16	9,484.52	316.65	887.93
RI (\$ mil.)	-4,846.34	3,982.14	-51.70	467.89
Net RI (\$ mil.)	-4,904.12	3,970.88	-59.69	473.70
OI / TA	-0.6821	0.4541	0.0858	0.0801
RI / TA	-1.3655	0.3534	-0.0131	0.1125
Net RI / TA	-1.3863	0.3152	-0.0218	0.1162

S/TC is the dollar value of cash or non-cash base salary earned by top 5 executives divided by total compensation earned by top 5 executives, B/TC the dollar value of bonus earned by top 5 executives divided by total compensation earned by top 5 executives, EEC/TC the dollar value of equity-based compensation (restricted stock granted value plus the value of granted option measured by the modified Black-Scholes model) earned by top 5 executives divided by total compensation earned by top 5 executives, MSO the percentage share ownership by top 5 executives, OI the operating income after deducting cost of goods sold, selling, general, and administrative expenses, and depreciation, RI the residual income, net RI the RI minus value of stock option granted to top 5 executives measured by the modified Black-Scholes model, and TA total assets.

B. Industry Distribution of Sample Firms

Industry	No	% Sample	Industry	No	% Sample
Retail	356	31.06%	Finance	56	4.89%
Software	244	21.29%	Commodity	47	4.10%
Utility	146	12.74%	Electronic	3	0.26%
Healthcare	104	9.08%	Petroleum	3	0.26%
Entertainment	98	8.55%	Aerospace	2	0.17%
Transportation	87	7.59%			

No. denotes the number, and % Sample the percentage of sample firms in the industry

Table 2. Regression Results

	Dependent variable		
	ROA	RI/TA	Net RI/TA
Intercept	0.0716*** (4.247)	-0.0446* (-1.948)	-0.0589** (-2.521)
S/TC	-0.0450** (-2.137)	-0.0227 (-0.796)	0.1005 (0.358)
B/TC	0.1143*** (4.263)	0.1696*** (4.665)	0.1911*** (5.149)
EEC/TC	0.0172 (0.802)	0.0287 (0.986)	0.0197 (0.664)
MSO	0.0517** (2.356)	0.0893*** (2.999)	0.0656** (2.158)
R²	0.46	0.54	0.55
F	26.38	35.79	38.19

S/TC is the dollar value of cash or non-cash base salary earned by top 5 executives divided by total compensation earned by top 5 executives, B/TC the dollar value of bonus earned by top 5 executives divided by total compensation earned by top 5 executives, EEC/TC the dollar value of equity-based compensation (restricted stock granted value plus the value of granted option measured by the modified Black-Scholes model) earned by top 5 executives divided by total compensation earned by top 5 executives, MSO the percentage share ownership by top 5 executives, ROA the operating income after deducting cost of goods sold, selling, general, and administrative expenses and depreciation divided by total assets, RI/TA the residual income divided by total assets, net RI/TA the RI minus value of stock option granted to top 5 executives measured by the modified Black-Scholes model divided by total assets. Unreported are the coefficients for the following industry dummy variables: Retail, software, utility, healthcare, entertainment, transportation, finance, commodity, electronics, petroleum, and aerospace.

*, **, and *** denote statistical significant at 10%, 5%, and 1% level, respectively. T statistics are in parenthesis.

Table 3. Results of t-tests for Mean Difference in Performance

Performance	Portfolio	Mean	Std. Dev.	2-tailed p value
ROA	High EEC	0.0950	0.0788	0.0039***
	Low EEC	0.0738	0.0855	
RI/TA	High EEC	-0.0120	0.0969	0.5438
	Low EEC	-0.0184	0.1362	
Net RI/TA	High EEC	-0.0260	0.0975	0.7571
	Low EEC	-0.0227	0.1426	

Sample firms are ranked by EEC/TA (equity-based compensation for top five executive divided by total compensation for those five), and top and bottom 40% firms are assigned to High EEC and Low EEC portfolios, respectively. Then, the mean performance measures for two portfolios are compared with the assumption of unequal variances. *, ** and *** denote statistical significance at 10%, 5% and 1% level, respectively.