

# Contributions to Firm Value by Stock-Based Compensation Plans

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*The goal of this empirical research is to determine the extent to which stock option plans contribute to firm value by comparing the estimated value of each firm to its actual value. If stock based compensation packages create the expectation of higher future earnings and if these higher expected earnings are included in the current market value of a firm, then the firm's value should contain a component that is unrelated to current earnings and is related to "investments" in stock-based compensation. This would be reflected in a higher firm value than could be expected in the absence of stock-based compensation.*

Almost 15 million U.S. workers receive stock options as part of their total compensation according to a study by the National Opinion Research Center of the University of Chicago (Labor Research Association, 2005). Stock options offer benefits to shareholders by linking employee wealth to shareholder returns (Jensen & Murphy, 1990). Granting stock options to employees as part of a compensation package means employees have the opportunity to purchase company stock at a preset (also known as exercise or strike) prices, so long as the employee remains with the company. The arguments in favor of granting stock options for compensation can be found in agency theory which explains that managers (agents) in the workplace are expected to act in the best interest of shareholders (principals), and that the actions of the agent can be better monitored through the use of incentives that link the goals of the agent to those of the principal (Lobingier, 2000). Before the award of stock options is made, according to this theory, management will have incentives to produce the performance-based results required to earn the stock option grant. Then, after the options are granted, management's stake in the firm will be larger. In both of these

examples, the options serve to align the incentives of management with the interests of shareholders (Griner, 1999).

When the market grew rapidly in the 1990s, companies willingly adopted employee stock option plans and implemented them generously (Brandes, Dharwadkar, Lemesis, & Heisler, 2003). In the meantime, the issue of granting stock options has taken on greater weight in light of recent financial scandals (Fich & Shivdasani, 2005). Additionally, this issue has received increased attention with the inception of accounting rules that require the granting companies to expense stock option grants made to employees. Beginning in 2006, all publicly traded companies must include the cost of employee stock options on consolidated earnings statements (Newman, 2006).

## Background and Hypothesis

### *Empirical Evidence*

Empirical evidence regarding the benefit of granting stock options is mixed. Jensen and Murphy (1990) found a weak relationship between change in shareholder wealth and change in CEO wealth. A human capital study by Watson Wyatt found that companies that differentiate employee bonuses based on performance and use stock-based compensation financially outperform those that do not (Emerman, 2005). Griner (1996) found a positive relationship between accounting-based performance and total compensation, but did not find any relationship between compensation and shareholder return. Griner (1999) also found that there is no association between grants of CEO stock options and changes in shareholder return. He states, "Granting stock options does not increase the probability that a firm will experience an increase in shareholder return between the year before the grant and the year after the grant. Firms that grant CEO stock options do not experience more favorable changes in shareholder return than firms that do not grant options" (Griner, 1999, p. 436).

Fich and Shivdasani (2005) measured the impact of stock option compensation on firm value for outside directors. They found that a firm's market-to-book ratio is positively related to the presence of a stock-option award plan for outside directors. The outside director option plan increases the market-to-book ratio, on average, by about 0.14. We suggest an alternative way to measure the benefit of granting stock options through the consideration of firm value using the Earnings Capitalization Model.

### *Calculating Firm Value Using the Earnings Capitalization Model*

In order to determine the extent to which stock option plans contribute to firm value, an estimated value of each firm must be compared to its actual market value. The estimates of value are based upon accounting measures of both earnings and the extent of stock-based compensation. The value of a firm is generally considered to be the present value of future benefits that are expected to accrue to the owners of the firm. The Earnings Capitalization Model is used to calculate the value of a business enterprise as the current or present value of the stream of expected future earnings of the enterprise. In practice, the future benefits of ownership are measured by reference to current and recent accounting earnings. A three or five year average of recent

accounting earnings is often used to establish the earnings stream that will be capitalized to produce an estimated firm value. In essence, this approach to value assumes that a firm's base earnings will continue in perpetuity and approximates the firm's value by taking the present value of these earnings. The Earnings Capitalization model can be simply stated as:

$$V = E/C$$

Where:

- V = estimated value of the firm
- E = adjusted earnings of the firm
- C = capitalization rate

This formula can be modified in order to include the portion of a firm's value that results from stock-based compensation. This modification results in the following:

$$V = E/C + O$$

Where:

- V = estimated value of the firm
- E = adjusted earnings of the firm
- C = capitalization rate
- O = option value (the value from stock-based compensation)

With this formula, it is possible to calculate the separate value (positive or negative) of a stock-based compensation plan using the accepted research methodology described in the subsequent section. Our test focuses on the existence of O, the option value, and the question of whether there is a component of firm value related to the stock-based compensation plan that exists independently of reported earnings.

#### Numerical Example with Hypothesis

Before proceeding to a formal description of the research methodology, a numerical example is presented that illustrates the conceptual basis for the test. Suppose a firm has experienced base earnings before compensation expense of \$1,200 and compensation expense of \$200, yielding net income of \$1,000. Assuming that a reasonable capitalization rate for earnings of firms in this industry is 10 percent, the earnings capitalization model would yield an estimate of firm value of \$10,000. If there are no other factors that impact firm value, and if we have obtained good measures for both earnings and the capitalization rate, we would expect the actual market value of the firm to be reasonably close to this \$10,000 estimate.

Now, suppose that instead of a pure cash salary, the company has a stock compensation plan that provides managers with a portion of their compensation in the form of stock options, while maintaining the same total compensation. Since compensation is unchanged, the reported earnings of the firm are unchanged, provided that accountants measure the cost of the compensation correctly. Consequently, the earnings capitalization method would result in the same estimate of firm value.

If, however, the stock compensation plan induces a higher level of motivation and goal congruence between managers and shareholders, then we would expect the actual market value of the firm to be enhanced by the expectation of improved management performance in the future and therefore it would be greater than the \$10,000 value indicated by the earnings capitalization model. In our example, an additional value of \$500 is assumed to be associated with the stock compensation plan. Since this value would not be captured by the earnings capitalization method, the existence of the plan would cause an estimation error of \$500.

Our test will attempt to determine whether stock-based compensation is consistently associated with estimation errors where the actual market value of the firm is above the estimate that is obtained using the earnings capitalization model. We will further examine whether these errors are related in magnitude to the extent of stock-based compensation. From this approach, we introduce our primary hypothesis:

Hypothesis 1: The firm's stock-based compensation expense will be positively related to firm value

#### *Accounting Concerns*

As mentioned previously, it is likely that accounting procedures in effect during our test period will result in errors in the measurement of compensation resulting from stock option plans. The numeric example is extended to consider the effect of these errors on our test.

We might assume that the accountants undervalue the compensation expense by \$125. This understatement results in an overstatement of earnings by the same amount and therefore will also result in an overestimate of the value of the firm under the earnings capitalization model. Here the overstatement of the value is by \$1,250. In this situation, the earnings capitalization model incorporates two errors: 1) it misses the value of the stock option plan and 2) it overestimates the firm's value due to the underestimate of compensation expense. These two effects are offsetting. When comparing the estimated value of the firm to its actual market value, the result will be an overestimate if the first effect is less than the second, and an understatement if the first effect is greater than the second. If there were no increase in firm value due to the stock plan, the expectation would clearly be that the estimated value under the earnings capitalization model would be greater than the actual market value of the firm.

On the other hand, we could assume that the accountants overvalue the compensation expense by \$125. This results in an understatement of earnings by the same amount and therefore will also result in an underestimate of the value of the firm under the earnings capitalization model. Here the understatement of the value is by \$1,250. In this situation, the earnings capitalization model also incorporates two errors: 1) it misses the value of the stock option plan and 2) it underestimates the firm's value due to the overestimate of compensation expense. These two effects reinforce each other. Our test will not distinguish between value created by a stock compensation plan and an estimation error resulting from an understatement of earnings due to an overstatement of the compensation expense associated with a stock compensation plan.

A review of the accounting treatment of stock-based compensation expense before 2006 indicates that there was a general tendency to understate the expense and therefore overstate both earnings and estimates of firm value that based were upon these earnings. This general tendency will bias the testing results against our hypothesis. Consequently, if a stock compensation plan creates no additional value for a firm, we would expect the overstated earnings associated with an understatement of stock compensation expense to result in the earnings capitalization model overstating the firm's value. In this case, the existence of a stock compensation plan would be associated with an apparent component of firm value that is negative (the bias against  $H_1$ ).

On the other hand, if a stock compensation plan does create additional value for a firm, then the effect of the additional value would tend to offset the overstatement of the value based upon the understated earnings, and our model may not identify the positive impact of stock compensation on firm value. If the effect of an earnings overstatement is greater than the additional economic value created by a stock compensation plan, then we would observe an apparent negative effect of the plan on firm value. Only if the economic value of the stock compensation plan is greater than the earnings overstatement effect will we observe the association of a stock compensation plan with higher firm values.

Therefore, if we observe a positive relationship between stock compensation plans and firm value, we can safely assume that the apparent value created by the plan is both real and large enough to overcome any tendency to overstate earnings in the presence of stock-based compensation. If we observe a negative relationship between stock compensation plans and firm value, we will be unable to conclude that the plans create any value. We must recognize that we could observe this outcome due to stock compensation plans actually detracting from firm value or from the effect of accountants generally understating compensation expense in the presence of stock-based compensation plans.

## Empirical Methods

### *Sample*

A sample of 297 firms was chosen from the Research Insight (Compustat) database. Since the earnings capitalization model generally cannot be applied to firms having negative earnings, any firm having earnings less than or equal to zero during the period of study was deleted from the sample. Firms are identified as being in the same industry if the first two digits of their SIC codes are the same. Alford (1992) found that grouping firms in this fashion provided meaningful sets with regard to industry level capitalization rates. Any industry containing fewer than 20 firms was deleted from the study. These selection criteria yielded a sample of 297 firms contained in six industry groups. An overview of the final sample is given in Table 1.

### *Definition of Variables & Description of Statistical Procedures*

Hypothesis  $H_1$  was tested using a least squares regression that related both earnings and stock-based compensation to actual firm value. Evaluation of the sign, magnitude and significance of the resulting slope coefficients ( $B_1$  and  $B_2$ ) indicated whether

earnings, stock-based compensation or both contributed significantly to firm value. This technique is commonly used in valuation experiments in order to determine the nature of an accounting or economic item's contribution to a firm's market value. The regression for the earnings capitalization model was defined as follows:

$$V_j = B_0 + (B_1 * E_j) + (B_2 * S_j)$$

Where:

$V_j$  is the actual market value of the  $j^{\text{th}}$  firm calculated as the product of the closing price and the number of shares used in the primary earnings per share calculation, and

$E_j$  is the earnings of the  $j^{\text{th}}$  firm calculated as the product of the  $j^{\text{th}}$  firm's primary earnings per share exclusive of extraordinary items and discontinued operations and the number of shares used for its primary earnings per share.

$S_j$  is the  $j^{\text{th}}$  firm's stock-based compensation expense.

**Table 1:** Overview of Industries Analyzed in the Study

Industry Number	Description of Industry	Number of Firms
2800	Chemicals & Allied Products	24
3500	Industrial & Computer Equipment	32
3600	Electric Motors, Switches, & Equipment	42
3800	Measurement Instruments & Watches	36
6000	Depository Institutions	119
6700	Holding & Other Investment Offices	44

## Results and Discussion

### *Statistical Results and Discussion*

Table 2 contains the results of the test of  $H_1$ . The coefficient  $B_2$  associated with  $S$  (the firm's stock-based compensation expense) is positive across each of the six two-digit SICs. The value of  $B_2$  ranges from 3 to 181. The consistently positive value of  $B_2$  indicates that firms with stock compensation plans have a positive component of firm value related to stock-based compensation that is unrelated to current earnings. The variability of the magnitude of the  $B_2$  coefficients across industries indicates that the impact of stock-based compensation on firm value, while consistently positive, varies in strength across industries. Overall, the results in Table 2 support our hypothesis ( $H_1$ ).

## Discussion

### *Interpretation of the Coefficient $B_2$*

The present value of future benefits associated with stock option plans consistently exceeds the cost of these plans in all industries examined in this study. In short, the implementation of stock-based compensation plans appears to add value to firms. The variability in the degree to which these plans impact firm value leaves an

interesting question for further study.

It is likely that the accounting cost of stock-based compensation plans does not fully capture the economic cost of these programs during the time period under review. Recent changes in the rules for accounting for these programs indicate the need for further study of this relationship in years subsequent to 2006. If accounting values consistently understate the annual economic costs of these programs, then the results are biased against the hypothesis ( $H_1$ ). Correction of this bias would increase both the magnitude and the significance of the impact of stock-based compensation already observed in this study. This is a further indication of the need for longitudinal study of this impact as accounting rules are adjusted to more closely reflect true economic costs.

**Table 2: Results of Regression Analysis**

Industry	$B_0$	$B_1$	$B_2$	$R^2$
<b>Chemicals &amp; Allied Products</b>	36.9	12.2	30.6	.61
t-stat	1.4	4.9	1.4	
Sig.	.17	.00	.17	
<b>Industrial &amp; Computer Equipment</b>	1.5	9.1	180.7	.59
t-stat	.1	5.3	3.5	
Sig.	.93	.00	.00	
<b>Electric Motors, Switches, &amp; Equipment</b>	40.1	6.6	2.5	.39
t-stat	2.2	2.7	4.1	
Sig.	.04	.01	.00	
<b>Measurement Instruments &amp; Watches</b>	16.2	11.4	41.3	.66
t-stat	1.2	7.7	1.6	
Sig.	.24	.00	.12	
<b>Depository Institutions</b>	-1.0	13.1	14.8	.91
t-stat	-.2	29.7	1.5	
Sig.	.83	.00	.15	
<b>Holding &amp; Other Investment Offices</b>	97.7	12.7	59.5	.72
t-stat	2.9	7.3	2.4	
Sig.	.01	.00	.02	

The results indicate that the amount of variance in firm value explained by both earnings and firm stock-based compensation expense ranges from 39 percent for Electric Motors, Switches, & Equipment firms to 91 percent for Depository Institutions. This indicates that there are other factors not included in the model that could help explain the variance in firm value beyond what was investigated in this study.

## Limitations, Conclusion and Implications

### *Limitations*

The data analyzed was from a single year. Similar results in a longitudinal study could extend and validate these initial findings. Consequently, we recommend analyzing data across several years in studies that attempt to extend these results. Also, since the  $R^2$  value indicates that earnings and stock-based compensation explained only 39 percent of the variation in value for firms in the Electric Motors, Switches, & Equipment sector, we recognize that this indicates that there are other factors not included in the model that could help explain the variance in firm value beyond what we investigated. Adding other related variables to the model, including net assets, may yield greater explanatory power across industries. The positive association between firm value and the existence of stock-based compensation plans was consistent over all of the industries studied, though the magnitude of the positive effect varied among these industries. This variation seems to indicate that stock compensation plans tend to add more value in some industries than in others. There could be many reasons for this, including the existence of other industry specific factors that were not identified in this study. This does not reduce the weight of the main finding, but rather points to an additional area for extension of this work.

### *Conclusion*

We hypothesized that stock-based compensation expenses would contribute positively to firm value and our research results support this hypothesis. In each industry, the positive value of  $B_2$  indicates that firms with stock compensation plans have a positive component of firm value that is related to stock-based compensation and unrelated to current earnings.

### *Implications*

Our results indicate that spending money on stock-based compensation is in the best interest of publicly traded companies. Firms might consider these findings, when examining this portion of their compensation packages, to indicate that spending in the area of stock-based compensation can be justified in terms of economic outcomes as well as employee motivation and preference.

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