# A Comparison of the Financing Benefit and Incentives of Non-traditional Options*

**Erick M. Elder****

and

**Larry C. Holland*****

**Abstract**

Traditional options are used much more extensively in compensation agreements compared to non-traditional options. This pattern is not consistent with research suggesting traditional options have less of an incentive effect compared to non-traditional options such as index and premium options. We develop a model for the use of stock options in compensation agreements based on a financing explanation. Our model shows that the extensive use of traditional options compared to non-traditional options is consistent with firms granting options for financing reasons.

*JEL Classification:* J33, G13, G32
*Keywords:* Employee Stock Options, Compensation Packages

This version: September 9, 2004

* The authors thank participants from the Financial Management Association, Eastern Finance Association, Midwest Economics Association, and Southern Economics Association meetings for helpful comments and suggestions. Any remaining errors are the sole responsibility of the authors.
** Corresponding author, Department of Economics & Finance, University of Arkansas at Little Rock, 2801 S. University, Little Rock, AR 72204-1099, email: emelder@ualr.edu, phone: (501) 569-8879.
*** Department of Economics & Finance, University of Arkansas at Little Rock, 2801 S. University, Little Rock, AR 72204-1099, email: lcholland@ualr.edu, phone: (501) 569-3042.

# A Comparison of the Financing Benefit and Incentives of Non-traditional Options


## Abstract

Traditional options are used much more extensively in compensation agreements compared to non-traditional options. This pattern is not consistent with research suggesting traditional options have less of an incentive effect compared to non-traditional options such as index and premium options. We develop a model for the use of stock options in compensation agreements based on a financing explanation. Our model shows that the extensive use of traditional options compared to non-traditional options is consistent with firms granting options for financing reasons.

# A Comparison of the Financing Benefit and Incentives of Non-traditional Options

## I. Introduction

Stock options are often used as part of a compensation package offered to the employees of a firm. Specifically, traditional options (whose strike price is normally set equal to the stock price on the grant date) are by far the most widely used type of option. Murphy (1999) documents that in a sample of 1000 firms only 1 firm offered options with the strike price indexed to the performance of the market, and less than 2% of the options granted in the sample were premium options; 95% of the regular option grants were traditional options. The use of stock options as part of compensation is usually justified on the basis that they provide incentives to employees in terms of increased compensation when shareholder wealth grows (i.e., the stock price increases). In this way, employees are enticed to act in the interests of owners to increase the value of the firm since their own wealth increases at the same time. Johnson and Tian (2000) show that several types of non-traditional options offer greater incentives compared to traditional options. Yet traditional options are the dominant type of option granted as part of compensation. Therefore, the extensive use of traditional options relative to nontraditional options is difficult for the incentive hypothesis to explain.

Specifically, Johnson and Tian (2000) examine traditional options as well as six non-traditional stock options with respect to their cost and their effects on effort, risk, and dividend yields. In their analysis, they use a risk-neutral approach to value the options and to calculate the incentive effects of the options. Using the options delta as a measure of incentive, they show that five of the six nontraditional options offer higher incentives per dollar cost of the option than traditional options. For example, index options show a cost-adjusted delta that is 93% greater than the delta for traditional options. We focus on two types of nontraditional options, premium options and index options, because Johnson and Tian (2000) specifically state that "Proponents claim that premium and performance-vested (index) options create stronger incentives to increase stock price." Even when we use what we consider a better measure of an option's incentive effects, the cost-adjusted certainty-equivalent delta, traditional options still have lower incentive effects compared to index and premium options. Therefore, if overcoming the agency problem were the main motivation for firms using options (assuming firms are rational and value-maximizing), we should not see such wide use of traditional options in practice. Instead, we should see other types of options being used since they provide more incentives for employees to increase the stock price.

Several hypotheses have been offered to explain the extensive use of options in compensation agreements. One hypothesis, a financing (or what Yermack [1995] refers to as a "liquidity") explanation, has received particularly little rigorous investigation with the exception of Core and Guay (2001) who use data for 756 firms during 1994-1997. They find that options are granted to non-executive employees more intensively when firms have greater financing needs and face financing constraints. In this paper, we offer a model of the use of options based on a financing explanation and show this explanation is theoretically consistent with the widespread use of traditional options versus non-traditional (specifically, index and premium) options.

As an anecdotal example of the financing explanation, on April 12, 2001, the Acxiom Corporation released a press announcement describing a program to reduce the cash salary of most of their employees, exchanging 5% of their cash salary for an equivalent number of stock options. Furthermore, on a voluntary basis, employees were allowed to exchange up to an additional 15% of their cash salary in a 2-for-1 match in stock options. Such a program reduces reported expenses as well as preserves internally generated cash. This example demonstrates that firms do indeed issue stock options as part of compensation for reasons other than incentives and control, specifically as a means to reduce cash expenses and thus cash financing needs.

When a firm issues options to it's employees, the firm receives a benefit as equity is issued at a cost less than the issuance cost in public capital markets. Lee, Lochhead, Ritter, and Zhao (1996) show an average flotation cost of 7.11% for seasoned equity offerings.[1] However, the firm must provide additional compensation above an all-cash salary to keep the employee at the same level of reservation utility as an-all cash salary. This approach is consistent with Lambert, Larker, and Verrechia (1991), Hall and Murphy (2002), and Muelbroeck (2000) who examine the implications of risk averse or undiversified employees valuing stock options less than the risk-neutral valuation. As these authors have show, there is a difference between the risk-neutral valuation and the value the employee assigns to the option. This difference may exist because employee

[1] The total cost of issuing external financing consists of direct costs as indicated by Lee, Lochhead, Ritter and Zhao (1996) and indirect costs measured as abnormal returns at the announcement of an offering. Asquith and Mullins (1986) indicate an announcement effect of –43.4% of the offering size. However, we conservatively assume that the indirect cost from an announcement effect is relatively small because it may not be persistent and perhaps reflects only an acceleration of the removal of asymmetric information. If in fact indirect costs are actually large, the conditions applicable for a financing explanation of the use of options will be broader than we show later.

wealth may not be fully diversified, often holding a larger portion of their wealth in securities (such as options) from their own firm. Indeed, some employees either are restricted in certain ways from hedging their position (e.g., officers and directors are restricted from selling short their company's stock), or some employees simply choose not to hedge their position due to transaction costs. Such an employee, therefore, will consider the option part of his compensation as having less value than the cost of those options to the firm and hence will discount the value of the option relative to the risk-neutral valuation. Thus, if a company uses options as a form of compensation, a higher level of compensation will be required to provide the same level of utility to the employee.[2]

This benefit and cost creates a tension between two forces. The firm desires to use more options in compensation because of lower financing costs but must increase compensation to maintain the same level of utility for its employees. The relative merits of alternative types of options depend on the cost of the option to the company versus how much the employee discounts the option.

Simulations of our model show that employees discount traditional options much less than either premium or index options, thus making it cheaper to use traditional

---

[2] It might at first appear plausible to sell options on the open market to receive the full cash value to compensate the employee with the cash equivalent and thus circumvent the discount an employee places on the stock options because of his undiversified position. However, there is no market for 10-year options for a firm. In addition, creating a synthetic option from a dynamically hedged portfolio also would likely have significant transaction costs and/or information effects. Thus, there would likely be costs parallel to the issuance costs already identified.

options if a company desires to preserve capital. Therefore, the widespread use of traditional options is consistent with a financing motivation.

The organization of this paper is as follows. Section II develops the model while Section III shows the results of the model using numerical simulation. Section IV provides a summary of our research.

## II. The model

The model used for this paper closely follows that discussed in Holland and Elder (2004). Suppose a firm with a financing constraint is trying to find an optimal way to compensate an employee. The firm can offer a cash-only salary of $\overline{C}$ to the employee, or can offer any combination of a certain amount of cash, $C$, and number of options, $n_o$, that the employee finds equally acceptable. At the end of the period, the payoff of an option is calculated as $V(S_T)=Max[(S_T-X),0]$, where $S_T$ is the terminal stock price and $X$ is the exercise price. The company stock price is determined by CAPM with a return volatility of the company stock of $\sigma_S$, a market return volatility of $\sigma_I$, and a beta of $\beta$. The instantaneous correlation of the stock return with the market portfolio return is therefore $\beta\sigma_I/\sigma_S$. The risk-free asset has a return of $r_f$ and the market risk-premium is $rp_m$. The options have a ten-year life. The employee has outside wealth of $\overline{W}$. His initial total outside wealth can include $n_s$ shares of company stock initially priced at $S_0$. The employee optimally allocates $\overline{W} - n_s S_0 + C$ between a market portfolio and the risk-free asset to maximize the employee's expected utility.[3] The employee has reservation utility of

[3] We are assuming the employee gets his full cash salary, $C$, at time 0 and is then free to invest that portion

$$\int_{I_T}\int_{S_T} p_{S_T} p_{I_T} U\left[ n_s S_T + \frac{\pi(\overline{C})W(\overline{C})}{I_0} I_T + (1-\pi(\overline{C}))W(\overline{C})e^{rT} \right] dS_T dI_T \tag{3}$$

where

$$W(C) = \overline{W} - n_s S_0 + C \tag{4}$$

is the amount of free wealth available to allocate between the market portfolio and a risk-free asset (see Ingersoll [2002], Hall and Knox [2003], Holland and Elder [2004], and Cai and Vijh [2003] for examples of other papers that include a market portfolio). When the employee receives $C$ amount of cash compensation, he optimally allocates $\pi(C)$ to the market portfolio and the remaining fraction to the risk-free asset.

The terms $p_{S_T}$ and $p_{I_T}$ indicate the likelihood the ending stock price and index values are $S_T$ and $I_T$ respectively. The initial value of the market portfolio is $I_0$. The participation constraint for the employee is

$$\int_{I_T}\int_{S_T} p_{S_T} p_{I_T} U\left[ n_o V(S_T) + n_s S_T + \frac{\pi(C)W(C)}{I_0} I_T + (1-\pi(C))W(C)e^{rT} \right] dS_T dI_T =$$

$$\int_{I_T}\int_{S_T} p_{S_T} p_{I_T} U\left[ n_s S_T + \frac{\pi(\overline{C})W(\overline{C})}{I_0} I_T + (1-\pi(\overline{C}))W(\overline{C})e^{rT} \right] dS_T dI_T \tag{5}$$

where $n_o$ is the number of options that must be granted to the employee in return for decreasing his cash salary by $\overline{C}$-$C$. Note that the optimal percentage allocated to the market portfolio changes as the cash-salary is reduced in exchange for options. The rate at which options are exchanged for cash reflects the employee's discount of the options because he is not a fully diversified investor.

---

between the risk-free asset and the market portfolio. We are abstracting away from the consumption-savings decisions of the employee.

From the firm's perspective, the reduction in the cash portion of salary would lower any external equity financing need by $\bar{C}$-$C$. The firm faces flotation costs of $F$ for raising capital from external capital markets. In order to generate this amount of cash in the public capital market, $(\bar{C} -C)/(1-F)$ would need to be issued. Thus, the financing benefit to the firm for using options in compensation to reduce issuance costs would be $(\bar{C} -C)F/(1-F)$. The firm alternatively can preserve cash by compensating employees with options in lieu of cash. There is an added cost to the firm when options are issued to the employee as part of compensation in lieu of strictly a cash salary. This additional cost occurs because the total compensation package needs to be larger to compensate for the additional risk associated with the options. If the company provides compensation of $n_o$ options and a cash salary of $C$, then the expected value of this compensation package from the firm's view is $n_o \int_{S_T} \left[ e^{-rT} p_{s_T} V(S_T) \right] dS_T + C$. The difference between this cost and the cost of paying a cash salary of $\bar{C}$ is the net cost to the firm for this compensation package, or $n_o \int_{S_T} \left[ e^{-rT} p_{s_T} V(S_T) \right] dS_T + C - \bar{C}$. The net benefit to the firm would be the financing savings less the extra cost of compensation. Therefore, the firm's objective is to choose an amount of cash, $C$, and a number of options, $n_o$, to maximize the net benefit simplified to

$$\frac{(\bar{C} - C)}{1 - F} - n_o \int_{S_T} \left[ e^{-rT} p_{s_T} V(S_T) \right] dS_T \qquad (6)$$

subject to the above participation constraint given in (5).

## III. Results

We assume the risk-averse employees have a power function utility preference, as follows:

$$U(\cdot) = \frac{(\cdot)^{1-\alpha}}{1-\alpha}$$

where $\alpha$ is the coefficient of relative risk aversion. We use numerical methods to solve for the optimal percent of cash and options. We first describe the results for an employee with an all-cash salary of $50,000, an initial wealth of $200,000 with no restriction to hold stock as part of wealth ($n_S = 0$), and a risk aversion of $\alpha = 2$. For the simulation of stock and index prices, we use the probabilities given by the bivariate lognormal distribution with $\sigma_S = 0.30$, $\sigma_I = 0.20$, $\beta = 1$, $\rho = 0.67$, $r_f = 0.04$, $rp_m = 0.065$, $S_0 = I_0 = 100$. The strike price for the traditional option is equal to the grant-date stock price of $100, the strike price of the premium option is $200, and the strike price for the index option is given by equation (9) in Johnson and Tian (2000). Based on these parameter values, the risk-neutral valuation of the traditional, premium, and index options are 49.1, 27.3, and 27.8 respectively.

To measure the incentive effects of the various types of options, we begin by calculating the certainty equivalent of a bundle of options (as outlined in Hall and Murphy[2002]). Specifically, we examine the incentive effects if the firm issues the employee 100 traditional options (in addition to the $50,000 salary), or an equivalent value (to the firm) of index or premium options. For traditional options, the employee values 100 options (the employee's certainty equivalent) at $4654. That is, the employee is indifferent between 100 traditional options and $4654 worth of cash. We measure the incentive effect of options by calculating the certainty-equivalent delta of the options, (i.e., how much does the employee's certainty equivalent change when the stock price changes). For traditional options, we numerically calculate the certainty-equivalent delta by calculating the difference in the certainty equivalents (of this bundle of options) when the stock price increases and decreases by $0.50. For 100 traditional options, the certainty-equivalent delta is .769. Since traditional options cost the firm 77% more than index options, we calculate the certainty-equivalent delta of 177 index options. For the bundle of 177 index options, the difference in the certainty equivalents (when the stock price increases and decreases by $0.50) is 1.01.[4] This suggests that the incentive effect of index options is 31% higher (for the same cost to the firm) than traditional options. For premium options, the certainty-equivalent delta is .889; higher than the incentive effects of traditional options. Therefore, even using a different metric to measure the incentive effects of various types of options, the Johnson and Tian results remain largely unchanged – index and premium options offer more incentives for employees to increase stock prices than do traditional options.

Next, we calculate the benefit firms receive by using various types of options to preserve cash. To do this, we use the model outlined in the preceding section. First, we take $5000 away from the employee's $50,000 salary and replace it with options. We calculate the number of options the employee requires to satisfy the employee's participation constraint using various types of options. We then calculate the cost to the firm of reducing the employee's salary by a given amount, replacing the salary with various types of options. Using this measure, we compare the benefit of using the various types of options for raising (or preserving) cash. Using traditional options, the employee

[4] Specifically, the certainty-equivalent delta for index options is 0.572 (per option). Multiplying this number by 1.77 results in the 1.01 cost-adjusted certainty-equivalent delta for index options reported above.

must be compensated with 107.9 traditional options and these options cost the firm $298 worth of additional compensation ($5298 worth of options less the $5000 cash). Alternatively, using index or premium options, raising this capital costs the firm $585 and $777 respectively (specifically, the employee must be given 200.7 index and 211.7 premium options). These results are due to the employee discounting traditional options far less than they discount the other two types of options.[5] Thus, from a financing viewpoint the use of traditional options should clearly dominate the use of nontraditional options. This is consistent with the current widespread use of traditional options. Once again, the preferred use of traditional options supports our hypothesis that firms use options in compensation because of a financing motivation when there is an external financing need.

## IV. Summary

Stock options are often used in employee compensation as an incentive to increase the value of the firm. However, non-traditional options should then be used to a much greater extent. We develop a model based on a financing explanation for the use of stock options in compensation agreements. We conclude that to the extent that options are granted for financing reasons, traditional options are superior to non-traditional options since employees discount traditional options comparatively less than non-traditional options. This provides a rational explanation for the predominant use of traditional options in compensation agreements.

[5] Specifically, the employee discounts the marginal traditional option at 5.6%, index option at 10.5%, and the premium option at 13.5%.

## References


Asquith, P. and D. Mullins (1986) Equity Issues and Offering Dilution, *Journal of Financial Economics*, **15**, 61-90.

Core, J. and W. Guay (2001) Stock Option Plans for Non-executive Employees, *Journal of Financial Economics*, **61**, 253-287.

Holland, L. and E. Elder (2004) Employee Stock Options in Compensation Agreements: A Financing Explanation, *Working Paper*.

Hall, B. and K. Murphy (2003) The Trouble with Stock Options, *Journal of Economic Perspectives*, **17**, 49-70.

Hall, B. and K. Murphy (2002) Stock Options for Undiversified Executives, *Journal of Accounting and Economics*, **33**, 3-42.

Hall, B. and T. Knox (2002) Managing Option Fragility, *NBER Working Paper* #9059.

Ingersoll, J. (2002) The Subjective and Objective Evaluation of Incentive Stock Options, *Working Paper* 0207, Yale International Center for Finance.

Johnson. S. and Y. Tian (2000) The Value and Incentive Effects of Nontraditional Executive Stock Option Plans, *Journal of Financial Economics*, **57**, 3-34.

Lambert, R., R. Larcker, and R. Verrecchia (1991) Portfolio Considerations in Valuing Executive Compensation, *Journal of Accounting Research*, **29**, 129-149.

Lee, I., S. Lochhead, J. Ritter, and O. Zhao (1996) The Costs of Raising Capital, *Journal of Financial Research*, **19**, 59-74.

Muelbroek, L. (2001) The Efficiency of Equity-Linked Compensation: Understanding the Full Cost of Awarding Stock Options, *Financial Management*, 5-44.

Murphy, K. (1999) Executive Compensation, in Orley Ashenfelter and David Card (eds.), *Handbook of Labor Economics*, **3**, North Holland.

Yermack, D. (1995)  Do Corporations Award CEO Stock Options Effectively?, *Journal of Financial Economics*, **39**, 237-269.