

## **How do Managers Value Stock Options and Restricted Stock?**

### **Abstract:**

We gather data from 192 managers and interview a dozen executives to investigate how they value stock options and restricted stock. We find that managers systematically overvalue options relative to both the Black-Scholes (B-S) value and fair-value equivalent restricted stock grants. Thus, contrary to conventional economic thinking, many risk-averse agents do not appear to discount B-S values. Managers value quick vesting and extended expiration. Managers also extrapolate recently rising stock prices when valuing both options and restricted stock. Overall, our results suggest that a combination of economic, behavioral and demographic factors explain managers' subjective valuations of options and restricted stock.

## How do Managers Value Stock Options and Restricted Stock?

### 1.0 Introduction

In this paper, we provide survey-based evidence on how managers, defined as current middle-level managers and future entry-level managers, value stock options and restricted stock. Such evidence is important for three reasons. First, even though option grants to non top-five executives have increased exponentially in recent years, the popularity of such broad-based equity compensation plans remains a puzzle for standard economic theory.<sup>1</sup> Second, many firms are now considering a cut of broad-based options or a switch from broad-based options to restricted stock (Deloitte and Touche 2005). Understanding the specific reasons for the usage or termination of broad-based options by firms requires knowledge of the costs and benefits to *employees* of such options relative to other compensation. Third, a fundamental premise underlying the traditional economics-based literature on stock options is that employees understand how to value them. If this premise does not hold, the efficacy of stock options as an incentive mechanism, and the findings from the literature that rely on this premise, are called into question. While indirect anecdotal evidence suggests non-top five employees are less likely to be informed about how options work, we provide direct evidence on how well these managers understand options and restricted stock.<sup>2</sup>

Investigating how non top-five managers value stock options using archival data is challenging, if not impossible. Financial statements and statutory reports of insider stock transactions do not provide details on option grants and exercises for such employees. Moreover, the subjective value of the option to an employee computed from available public data is likely

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<sup>1</sup> The National Center for Employee Ownership's website reports that 14.6 million individuals, representing 14.4% of employees at for-profit-companies have been awarded options. Jensen, Murphy and Wruck (2004) report that 90% of options of S&P 500 companies for the year 2002 were awarded to employees other than the top five officers of the firm.

<sup>2</sup> A survey conducted by Fidelity Workplace Services (2003) found that nearly half a million U.S. households let options expire from late 1999 through late 2000, a period spanning bull and bear markets, because they did not understand such plan specifics on how to exercise stock options.

fraught with considerable measurement error because of the numerous assumptions that the researcher has to make regarding the employee's utility function, risk aversion, his outside wealth and exercise behavior (e.g., Lambert, Larcker and Verrecchia 1991; Muelbroek 2001, Hall and Murphy 2002; Bettis, Bizjak and Lemmon 2005 for attempts). To overcome these barriers we conduct a survey in November 2004 where we ask managers how much cash they would exchange for stock options or restricted stock (i.e., certainty equivalents) in scenarios where we manipulated several key option parameters such as vesting date, term to expiration, stock return volatility and whether the firm's recent stock return momentum has been positive or negative. We also ask how many shares of restricted stock participants would be willing to exchange for a fair value equivalent number of stock options. Our objective is to assess how managers value stock options and restricted stock conditioned on three broad categories of variables: (i) economic factors such as managers' subjective expected rate of appreciation in stock price, their risk aversion, their personal wealth levels and the proportion of their personal wealth tied up in the firm; (ii) behavioral factors such as reacting to recent trends in stock prices, optimism about uncertain future outcomes, a taste for viewing options as lottery ticket-like gambles, an understanding of how options and restricted stock work, experience with stock options and restricted stock and heuristics related to option and stock valuation; and (iii) demographic variables such as age, gender and full-time work experience.

We recruit participants from two groups intended to reflect the wide spectrum of employees who receive options under a broad based compensation plan: (i) 79 executive MBA students who represent current middle-level managers; and (ii) 113 daytime MBA students who represent future entry-level managers. The mean executive (daytime) MBA participant has 12.2 (5.6) years of work experience. We validate our survey questionnaire and supplement our survey data with a dozen field interviews with senior executives.

Our key findings are as follows. The mean manager in the sample overvalues stock options relative to (i) the theoretical Black-Scholes (B-S) value, (ii) an equivalent fair value

package of cash, and (iii) an equivalent fair value package of restricted stock. In particular, the mean manager assigns a subjective value of \$38,681 for an option package whose B-S value is \$30,000 (29% overvaluation). Moreover, he wants 1,907 restricted shares in exchange for the \$30,000 B-S value option package in spite of being clearly told that each restricted share trades at \$30 per share (and he should hence expect 1,000 restricted shares) (91% overvaluation). Note further that such overvaluation of options, especially in a post technology stock bubble environment and multiplied over several hundred employees in a firm, is likely to have powerful economic consequences. Such over-valuation of options is consistent with (i) psychology literature on optimism with respect to uncertain but positive expected future outcomes (Weinstein 1980; Taylor and Brown 1988) given that the “leverage” effect of options would ensure that managers take home a larger dollar amount of compensation, relative to restricted stock, when the stock price is expected to appreciate rapidly in the future; (ii) evidence in Hallock and Olson (2004) drawn from exercise decisions of employees in one firm; and (iii) theories by Oyer and Schaefer (2004) and Bergman and Jenter (2004) who posit that employees attach a sentiment premium to option valuation and firms exploit that sentiment to screen for optimistic employees and thus reduce their compensation costs. More important, over-valuation of options is inconsistent with a long-standing idea in the economics literature that managers would assign a discount (or under-value) to B-S option values (e.g., Lambert, Larcker, Verrecchia 1991, Muelbroek 2001; Hall and Murphy 2002).

When we probe the over-valuation further, we find that certainty equivalents for options (i) increase in participants’ subjective expectations of future share price, consistent with the economic predictions; and (ii) in the skewness of subjective price expectations suggesting that some managers view options as “long shot” gambles or “lottery tickets” (Golec and Tamarkin 1998). Significantly, proxies for risk-aversion and personal wealth are not robustly associated with subjective valuations of stock options.

The mean manager discounts the subjective option value by 10.18% ( $\$3,938/\$38,681$ ) when vesting is delayed from one to three years. However, he increases his mean subjective option valuation by 15.13% ( $\$5,881/\$38,681$ ) when the option expiration date is extended by five years, consistent with economic expectations. The mean manager behaves like a momentum trader and tends to extrapolate a recent run up in stock prices to his valuation of stock options and restricted stock. We find no significant change in participants' subjective valuations of option or restricted stock when we increase stock return volatility, inconsistent with economic expectations. Another consistent theme in the results is that participants who do not have a good understanding of option valuation tend to systematically misvalue options. This suggests that education plays a critical role in mitigating misvaluation. Unfortunately, our interview evidence suggests that firms do not appear to invest substantial resources in training managers on how to value options and restricted stock.

Our work makes several contributions to extant research on broad-based employee stock option plans. First, we provide some of the first systematic evidence on the subjective valuations of options and restricted stock, and the sources of variation in such valuations, across current and future managers. Our results suggest that such valuations are consistent with several economic predictions but behavioral and demographic considerations also play an important, and hitherto under-emphasized, role. Our findings suggest that researchers might want to think about incorporating behavioral and demographic measures such as the employees' subjective expectation of stock price or ignorance/knowledge of options into option valuation models.

Second, the option overvaluation result contrasts with conventional economic wisdom that employees will assign a discount ranging from 20% to 80% to the B-S value of the option (e.g., Lambert, Larcker and Verrecchia 1991; Muelbroek 2001; Hall and Murphy 2002 and Bettis, Bizjak and Lemmon 2005). We find no evidence of such a "deadweight loss" between the cost of the option to the firm and the perceived benefit from that option to the manager. In contrast, the effective cost of issuing an option to a non top-five manager is smaller than the B-S value.

Third, our evidence that managers systematically over-value stock options in relation to restricted stock is consistent with recent theories by Oyer and Schaefer (2004) and Bergman and Jenter (2004) that firms have broad-based option plans to attract optimistic employees. This strategy reduces the firm's overall compensation expense by extracting a sentiment premium from their employees.

Finally, we hope that our survey results are useful to researchers in modifying existing theories and developing new theories about why broad-based option plans exist. Further, our results will likely be useful to business practitioners in appreciating how a relatively large sample of non-top five executives value stock options and restricted stock at a time when many firms are considering either a cutback in broad-based option plans or a switch from options to restricted stock in response to the FASB's new requirement that firms start expensing the cost of options after December 2005.

The remainder of the paper is as follows. Section 2 describes how we conducted the survey and the characteristics of our sample. Section 3 summarizes evidence on the subjective valuation of options and restricted stock. Section 4 presents results on how subjective valuations of options and restricted stock change with a change in the valuation inputs, such as vesting date, time to expiration and stock return volatility. Section 5 presents additional analyses and section 6 concludes. In sections 3-5, we discuss our results for options followed by those for restricted stock. Where relevant, we enrich our results by including comments from interviewed executives.

## **2.0 Survey methodology and descriptive data**

### *2.1 Surveys versus archival research*

Conducting an archival study of how managers value stock options and restricted stock is difficult for several reasons. First, FASB and SEC mandated disclosures on stock and option holdings are only required for the top five highly compensated executives of a firm, and most employees are obviously exempt from that requirement. Second, even for these top five

executives, researchers generally do not have access to vital information on which employees' subjective valuations depend, such as their utility functions, outside wealth and risk aversion. Several papers in the literature have tried to circumvent these data limitations by extrapolating middle- and lower-level option holdings from the holdings of the top five executives (e.g., Core and Guay 2001, Kedia and Mazumdar 2002). However, Oyer and Schaefer (2004) point out that such undertakings are likely fraught with measurement error that can potentially change inferences.

Other researchers (e.g., Hall and Murphy 2002, Bettis, Bizjak and Lemmon 2005) assume risk aversion parameters and outside wealth of the executives to equal some multiple (e.g., one to three times) of their current compensation. Whether such assumptions mirror reality is not obvious because data on outside wealth, employees' expectations of future performance of their stock and their risk aversion parameters are not readily observable.

A survey instrument has the potential to overcome these limitations by directly asking managers about their outside wealth, risk aversion and future performance expectations. Moreover, surveys and interviews offer an opportunity to ask managers very specific qualitative and quantitative questions about their subjective valuations of options and restricted stock. Initially, we set out to solicit survey responses from a broad cross-section of employees in different companies in the economy. We contacted several technology companies along the West Coast of the U.S. to investigate whether they would allow us to run such a survey. They would not, however, stating that their Legal and Human Resource departments were not keen on sponsoring employee surveys on options or on future stock price expectations in the post-technology bubble environment.

We settled on the next best alternative by conducting the survey on two groups of participants: (i) current middle-level managers enrolled in an executive or evening MBA

program; and (ii) future entry-level managers enrolled in a daytime MBA program.<sup>3</sup> We purposefully targeted these two groups to account for the wide spectrum of employees who typically receive options under a broad-based compensation plan. Our current and future manager participants hold stock and options in 46 (predominantly West coast) companies and thus cover a broad cross-section of firms. Moreover, all our executive and evening MBA participants are at least middle-level managers (with some more senior) from a variety of western U.S. firms. We discuss our participants in greater detail in section 2.4.

As with all other research methodologies, the survey methodology has several potential limitations. First, surveys measure beliefs, not actions, and the two may not coincide. Second, participants might interpret individual questions differently than we intended. As we describe in the next section, we extensively piloted our instrument to minimize this concern. Third, surveys are subject to non-response bias. Our high response rate (69%), however, likely limits the extent to which non-response bias potentially influences our results. Finally, survey respondents might not be representative of the underlying population, though our choice to use a broad cross-section of current and future managers likely increases the generalizability of our results relative to a firm-specific survey. Despite these limitations, we believe that conducting a survey is perhaps the only way to address our research questions, and that our unique dataset provides valuable information on how managers subjectively value stock options and restricted stock.

## *2.2 Survey design and delivery*

Our survey asks participants to reveal certainty-equivalents for a proposed compensation package of either 3,000 stock options with a fair value (B-S value) of \$10 per option or 1,000

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<sup>3</sup> The cost of this approach, of course, is that our results might not generalize to the entire population of U.S. firms. Arguably however, the western United States, with its preponderance of well performing high-technology firms, is a powerful setting for investigating our research question. Notwithstanding this caveat, we believe our results provide unique evidence on how managers subjectively value options and restricted stock and are informative as to why broad based equity compensation plans exist.

shares of restricted stock with a share price of \$30 per share.<sup>4</sup> This equity package is given on top of a cash package of \$80,000. We set the cost to the company of the equity component of the compensation package (both the fair value of the option package and the fair value of the restricted stock package) at \$30,000. We developed and extensively pilot tested our survey. During the design phase, we solicited feedback from interviewed executives, academic researchers and survey-design experts with the objective of minimizing biases associated with the questionnaire and maximizing our response rate. We incorporated their feedback and prepared a “beta” version of the survey, which we pilot tested using doctoral students. After conducting the pilot, we once again revised and shortened the survey. The final survey was 11 pages long and contained 10 questions, most with sub-questions.

We administered the survey in November 2004 to two groups of participants at a large state university in the Northwestern U.S. We recruited our current middle-level manager sample from three classes: the core executive MBA financial reporting class with an enrollment of 74 students, the advanced managerial accounting class for executive MBAs with an enrollment of 55 students, and the core evening MBA financial accounting class with 52 students. We recruited our future entry-level manager sample from two classes; the core daytime MBA financial accounting class with 99 students and an advanced daytime MBA financial accounting elective class with 55 students. Of the 280 potential participants in these five classes, 192 participants completed our survey, resulting in a response rate of 68.6%. Unless otherwise mentioned, our analysis on the following pages is based on this group of 192 participants.

The response rate of our classroom-based survey is high relative to those typically reported for mail-based surveys. For example, Graham, Harvey and Rajgopal (2005) report a

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<sup>4</sup> For ease of exposition, we refer to our instrument as a “survey” even though it has attributes of both a survey and an experiment. Similar to an experiment, we ask for valuations of options at a hypothetical company, manipulate option valuation inputs and calibrate valuations from such manipulations to a “control” base case condition. Similar to a survey, we ask for extensive demographic information from our participants and condition their responses on such information.

10% response rate, Trahan and Gitman (1995) a 12% response rate, and Brav, Graham, Harvey and Michaely (2005) an 18% response rate. Our response rate is high because the instructors we worked with reminded their students several times that participating was important for research, and we promised to distribute to anyone who completed the survey, a one-page description of how stock options and restricted stock are typically valued. Our high response rate reduces the probability that non-response bias influences our results. Of course, we can never be sure whether students who self-select to attend a graduate business school are not systematically different from other lower- and middle-level managers.

### *2.3 Interview design and delivery*

In addition to the survey, we separately conducted 12 interviews with the following executives: one CEO, two vice presidents (VP) in human resources (HR), three CFOs, two treasurers, three controllers and a middle-level executive. We also interviewed two entry-level employees. We interviewed executives from large publicly-traded firms in the western United States, some of whom are heavy users of broad based options and restricted stock plans. We deliberately picked a wide cross-section of executives with different seniority levels and expertise to maximize the chances of getting different perspectives. We conducted all but one of the interviews via telephone conference calls. We arranged the interviews with the understanding that the identity of the firms and the executives would be kept confidential.

We began each interview with a question asking the interviewee to describe their firms' compensation practices related to broad-based equity plans. After these introductory remarks, we asked questions that are similar to those that appear on the survey. The interviews lasted from 30-45 minutes. We integrate the interviews with the survey results to reinforce or to clarify survey responses. We believe that the interviews (i) validate questions asked on the survey; and (ii) add depth to our survey responses and facilitate understanding our survey data.

## 2.4 Descriptive data

Columns 1 and 2 of panel A of Table 1 report demographic data for our sample. Column 1 represents 79 current middle-level managers enrolled in the executive or evening MBA program, while column 2 represents 113 future entry-level managers enrolled in the daytime MBA program.

The mean age of our executive (daytime) MBA participants is 34.4 (29.1) years and their mean work experience is 12.2 (5.6) years. The mean executive (daytime) MBA participant expects to stay at his current or anticipated job for 7.5 (5.8) years and all participants have at least an undergraduate degree. We rely on a question originally posed in Kahneman and Tversky (1979) to calibrate participants' attitudes toward risk. We classify participants that answered less than 50 as risk averse, equal to 50 as risk neutral, and greater than 50 as risk seeking.<sup>5</sup> Participants on average took between 26 – 32 minutes to complete the survey. At least 60% of each group expects the stock price of the survey firm to increase during the coming year. The mean executive participant expects a 22.3% return  $[(36.7/30)-1]$  and the mean daytime MBA participant expects a 19.3% return.

Approximately 68% (26%) of our executive (daytime) MBA participants have received stock options in the past whereas only 24% (10%) of the executives (daytime) MBA participants have received restricted stock, reflecting that options are the more prevalent form of broad-based equity compensation. Executive and daytime MBA participants identified 46 (untabulated) firms in which they held options or restricted stock, with Microsoft and Boeing being the dominant companies. The median executive MBA's wealth lies in the \$100,000-\$299,000 range whereas the median daytime MBA's wealth is in the \$20,000-\$40,000 range. For those that responded to

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<sup>5</sup> In particular, the question asks "Would you be willing to participate in a gamble where you have a 50% chance of winning \$10 and a 50% chance of losing \$10, or would you prefer not to play the gamble?" Participants responded by marking a scale with endpoint labeled "0 = extreme unwillingness (no gamble)" and "100 = extreme willingness (gamble)." Kim (1992) used the same question to elicit risk preferences for undergraduate accounting seniors and finds that half of his participants are risk-averse. Relative to Kim (1992), 60.8% (42.7%) of our executive (daytime) MBA participants are risk-averse.

our wealth question, the stock or option portfolio of our mean executive (daytime) MBA participant is 13.1% (9.0%) of his total wealth. These managers appear to be fairly diversified relative to the extent of (assumed) firm-specific wealth in a top five executive's portfolio. For example, Bettis et al. (2005) assume that the outside wealth of an executive classified as a corporate insider (and hence presumably a senior executive) is twice as much as his firm-specific option holdings (roughly 1/3<sup>rd</sup> is firm-specific).

In untabulated correlation statistics, we find risk aversion and age are negatively correlated (Spearman  $\rho = -0.22$ ), suggesting that younger participants are more risk seeking. Participants with option experience are less risk seeking (Spearman  $\rho = -0.21$ ) and report having a greater understanding of options (Spearman  $\rho = 0.27$ ).

### **3.0 Option and restricted stock valuation**

We begin with a brief discussion of our ex-ante expectations that managers' subjective valuations of options and restricted stock are likely driven by a combination of three sets of factors: (i) economic; (ii) behavioral; and (iii) demographic. We discuss these factors, drawn from prior literature, in greater depth below.

#### *3.1 Economic factors*

Standard economic theory suggests that an employee would be willing to exchange option-based compensation for a cash amount smaller than the current B-S value of the option portfolio because (i) the employee's investment portfolio is sub-optimally diversified, and (ii) he is risk-averse (e.g., Hall and Murphy 2002). Hall and Murphy (2002) estimate, under reasonable risk aversion and diversification assumptions, that the value of an option to a risk-averse employee can be as little as 21% of the B-S value of the option. Further, Hall and Murphy (2002) conduct simulations to show that higher risk aversion, lower wealth and greater concentration of wealth in the company stock is negatively related to their estimates of subjective option

valuations. Meulbroek (2001) makes a similar attempt to assess the efficiency loss of forcing employees to hold an undiversified portfolio with a concentrated exposure to their employer's stock. She estimates that managers at a NYSE-listed company with all their assets tied to the stock price would value typical options (10 year life and 3 year vesting period) at 70% of their cost to the employer. The difference between the fair value of stock options (i.e., the cost to the company) and the certainty equivalent of that compensation constitutes a dead-weight loss to the firm (Lambert, Larcker and Verrecchia 1991). Several papers (Heath al. 1999; Hemmer et al. 1996; Huddart and Lang 1996) show that employees tend to exercise options early and leave money on the table relative to the B-S value, providing support for the deadweight loss associated with employee stock options. A review of the cited papers suggests that the economic model predicts that the subjective valuations of options will (i) reflect a discount with respect to B-S value of the option; (ii) increase with the firm's stock price; (iii) decrease in employee risk aversion; (iv) decrease in wealth levels and the concentration of wealth in the company's stock; and (v) increase in stock return volatility (which we explore more fully in section 4.3).

### *3.2 Behavioral factors*

The B-S model incorporates expectations about future stock price (via an equilibrium asset-pricing model such as the CAPM) but does not entertain a role for subjective expectations of future price. However, behavioral research suggests several potential ways in which subjective expectations of future price might enter into an employee's valuation: (i) optimism; (ii) heuristics; (iii) level of understanding of, and familiarity with, options; and (iv) stock price momentum (discussed in section 5.1).

There is evidence in psychology that a person believes he will experience positive future events with greater probability than is objectively justified (Taylor and Brown 1988; Weinstein 1980). Applied to our context, employees might be overly optimistic about the upside potential

of an option.<sup>6</sup> Such optimism would apply equally to options and restricted stock suggesting over-valuation of each security. Note, however, that because the fair value of restricted stock is the current stock price, there may be little room for optimism. Moreover, if the employee is an optimist, he can buy the firm's shares on his account in the open market. Options with expiration dates three to ten years out, on the other hand, cannot be easily purchased on the open market. Moreover, the leverage feature of options offers more units of equity per dollar "invested" relative to restricted stock. Thus, we expect an optimistic employee to over-value options more than restricted stock.

Oyer and Schaefer (2004) and Bergman and Jenter (2004) argue that if employees are optimistic about their employers' prospects, they may prefer stock option grants to equally costly (from the firm's fair value point of view) restricted stock grants. These papers suggest that firms can reduce the effective economic cost of compensation by granting stock options because employees value the options above the cost to the firm. Hallock and Olson (2004) empirically investigate the value employees place on stock options using information from the option exercise behavior of individuals from one manufacturing firm and find that these employees overvalue options relative to the B-S value.<sup>7</sup> Lambert and Larcker (2001) report tentative survey evidence, drawn from 122 readers of the Knowledge@Wharton.com newsletter, suggesting that many employees have unrealistic expectations about future stock prices and frequently value their options substantially above B-S values.

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<sup>6</sup> This prediction would be more credible if we could demonstrate a link between participants' expectations of our experimental firm's stock price and participants' expectations of their own firm's stock price. Indeed, the Pearson correlation between a participants' expectation of Firm Z's stock price appreciation over the next year and their own firm's stock price appreciation over the next year is 0.41 ( $p < 0.01$ ).

<sup>7</sup> Hallock and Olson's (2004) analysis is based on the observation that an employee will choose to hold an option for another period (e.g. day, week, or month) if the utility of the income she would receive (e.g. stock price – exercise price) by immediately exercising the option is less than the value from holding the option and reserving the right to exercise it on a later date. Thus, the decision to exercise or hold an option for another period provides information needed to infer the value employees place on an option at any point in time when the option could be exercised for a profit (e.g., stock price – exercise price > 0).

Some observers have suggested that employees might view options as “long shot” gambles (or “lottery tickets”). Golec and Tamarkin (1998) show that horse race gamblers place low probability-high variance bets despite their low expected returns not because they are necessarily risk loving, but because they have a preference for skewness in bet returns. Employees’ subjective valuations of options might exhibit such a preference for skewness as well.

### *3.2.1 Understanding of options/heuristics*

When making judgments and decisions under uncertainty, individuals often rely on a limited number of simplifying heuristics rather than formal models (for an overview of the heuristics and biases literature see Gilovich, Griffin, and Kahneman 2002). We attempt to capture participants’ use of potential valuation heuristics by having them complete an option/restricted stock valuation test prior to beginning the case. In particular, we ask participants to estimate the fair value of one stock option and one share of restricted stock under different market prices. After completing this test and sealing it in an envelope, participants begin the case. The terms of this case are as follows:

Grant date:	Today
Vesting date:	Today
Expiration date:	2 years from today
Exercise price:	\$20 per share
Risk-free interest rate:	4 percent
Stock price volatility:	30 percent

After presenting this information, we ask participants for the approximate fair value of (i) one stock option, and (ii) one share of restricted stock when the firm’s current stock price is: \$5, \$10, \$20, and \$40. Note that we deliberately ask participants for the “fair value” without reference to a “Black-Scholes value” or a “certainty equivalent” value. The purpose of this question, and the reason we have participants answer it after reading the definitions of terms used in the survey, but before seeing the other materials, is to examine how well employees intuitively understand the concepts underlying stock option and restricted stock valuation.

The results related to this test are reported in Table 2. Even though participants are not given B-S values, we provide this information in Table 2 to benchmark their responses. The valuation exercise related to restricted stock is rather straightforward. We expect an informed participant to realize that the fair value per unit of restricted stock is simply the current market price of the firm's stock. Panel A of Table 2 shows that 62.6 – 66.7% of participants provided the “correct” (current market price) answer when valuing the restricted stock. If at any time a participant indicated that a share of restricted stock had zero or negative value we labeled them “RS ignorant.” Note also that only 8.0 – 12.8% of participants (last row of Panel A) recorded a fair value higher than the correct answer (labeled “RS optimists”). As is clear from panel B, participants are somewhat less successful when valuing stock options. For example, more than half the sample over-values options relative to the B-S value (last row of panel B). These data suggest that participants intuitively understand how to value restricted stock better than they do stock options.<sup>8</sup>

We label a participant as “option ignorant” if he falls into one of the following categories: (i) the 34.0% of participants who think that an option issued at-the-money (\$20 stock price condition) has no value; or (ii) the 10.6% of participants who think that underwater options have negative fair values; or (iii) the approximately one-fifth of participants (ranging from 17.0 to 24.5%) who thought that the firm's current stock price was the fair value of the option.

We label the 50% of participants who think that the fair value of the option is greater than the B-S value as “option optimists.” Note that a third of participants answered that the value of an option is its intrinsic value when the option is in-the-money (34.0% under the \$20 stock price condition, 31.7% under the \$25 stock price condition, and 32.3% under the \$40 stock price condition). We label such participants as “intrinsic-value users.” We report our subsequent results conditioned on the type of option and RS understanding exhibited in this ease of

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<sup>8</sup> One CFO states “with restricted stock, you know what the value is and you don't have the craziness of Black-Scholes. Restricted stock is far easier for an employee to wrap his head around.”

understanding test. Note that these groups of users who display several related “ease of understanding” characteristics are not mutually exclusive. The last variable we include in our list of behavioral factors is a participant’s familiarity with options and/or restricted stock. We predict that participants who are familiar with (i.e., have been granted options or restricted stock in the past) are less likely to misvalue them.

### *3.3 Demographic factors*

Besides the above economic and behavioral factors, we conjecture that several demographic factors such as group membership (executive / daytime MBA), experience, gender and employee age would also potentially explain subjective valuations of options. For example, we predict that executive MBAs and older participants are more likely to have experience valuing options and restricted stock and are therefore less likely to misvalue them.

### *3.4 Survey valuation question*

In the survey, we ask participants to assume that they are joining a firm. We then ask them how much cash they would require in exchange for the following option package being offered by the firm (on top of \$80,000 in cash compensation):

Number of options:	3,000
Grant date:	Today
Vesting date:	1 year from today
Expiration date:	5 years from today
Stock price today:	\$30 per share
Exercise price:	\$30 per share
Risk-free interest rate:	4 percent
Stock price volatility:	30 percent
Fair value:	\$10 per option

We define all of the above terms for participants on the first-page of the survey. In addition, we inform participants that the consensus long-term analyst forecast for the firm (Firm Z) projects a 30% annual increase in earnings.<sup>9</sup> The B-S fair value of the option package is

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<sup>9</sup> We also ran a version where the growth rate in earnings was set at 5%. However, we did not find meaningful differences in the responses between the 5% and 30% groups, perhaps because participants thought in an efficient market future growth rates are already captured in a firm’s stock price. For ease of exposition, we combine our 5% and 30% participants in all subsequent discussions.

\$30,000. The B-S value is based on the above parameters, most notably a full five-year term. We instruct participants to ignore tax considerations throughout the survey.<sup>10</sup> We ask each participant for the amount of cash they would require in exchange for the option package (certainty equivalent).<sup>11</sup>

Results presented in Panel A of Table 3 show that the mean participant assigns a cash value of \$38,681.71 to options that are theoretically worth \$30,000. This incremental \$8,681.71, which can be viewed as a 29% ( $\$8,681/\$30,000$ ) over-valuation premium assigned by managers to options, is statistically different from zero at conventional levels ( $p < 0.01$ ). Note that the median participant assigns a value equal to the B-S fair value of \$30,000. However, the median statistic obscures information about the distribution of certainty equivalents. Approximately 34% of participants ask for exactly \$30,000 while 41.5% of participants demand more than \$30,000. Only 24.5% of participants ask for a cash value less than \$30,000.

To get a sense for how managers perceive restricted stock relative to options (i.e., their exchange ratios), we asked participants for the number of shares of restricted stock they would require in exchange for the options package. Recall that the B-S value of the option package is \$30,000. Hence, if employees are indifferent between stock options and restricted stock, we expect them to require 1,000 shares of restricted stock in exchange for the option package.

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<sup>10</sup> We did not explicitly instruct participants to ignore dividends. We believe dividends would constitute a second-order effect in our context because most technology companies in the western U.S., where our survey is based, rarely pay dividends. Moreover, dividends lower the fair value of the option. Hence, if some participants factor in dividends into their valuation decision, then the option over-valuation, we document later, is understated.

<sup>11</sup> Besides the certainty equivalence question, we also ask for (i) fair values (or the change in fair value) of the option or restricted stock; and (ii) a directional question in addition to cash dollar values because we thought participants might find it easier to provide the direction in which their certainty equivalent changed when one of the option pricing inputs changed relative to assigning an approximate dollar value to the change. The results related to the directional question are qualitatively similar to the certainty equivalent results. Analysis of the fair value questions did not reveal major new insights worth devoting a lot of space to in the paper. Hence, for the sake of brevity, we have not tabulated detailed statistics on the fair value and directional questions.

Untabulated results suggest that the mean manager exhibits an overwhelming preference for options. Specifically, the mean manager requires 1,907 shares of restricted stock in exchange for the option package. This is statistically greater than the 1,000 shares one would require if they were indifferent between restricted stock and stock options ( $p < 0.01$ ). The median participant again requires the theoretically correct number of shares, however this statistic obscures the fact that 41.2% of participants demanded more than 1,000 shares. Only 10.7% of the participants demand less than 1,000 shares. To keep the presentation of numbers in the tables manageable, we only discuss results related to cash certainty equivalents for options and restricted stock. The inferences related to the number of restricted shares expected in exchange for options are identical to those reported for cash certainty equivalents and are available from the authors on request.

### *3.5 What drives subjective over-valuation of options?*

In this section, we explore which of the economic, behavioral and demographic factors might potentially explain the over-valuation of options. Univariate correlations reported in panel B of Table 3 suggest that the cash certainty equivalents expected by participants increase in the expected stock price (Pearson  $\rho = 0.43$ ,  $p < 0.01$ , one-tailed), one of the economic factors. Interestingly, option optimists, one of the behavioral factors, are also associated with higher certainty equivalents (Spearman  $\rho = 0.17$ ,  $p = 0.01$ , one-tailed).

Multivariate regression results, reported in panel C, are structured to introduce the effects of three sets of variables: (a) economic, (b) behavioral and (c) demographic. Column (1) includes only the economic factors. Consistent with expectations, we find that cash certainty equivalents increase in expected stock price (coefficient = 9.23, t-statistic = 5.65). The coefficient on expected stock price seems remarkably low perhaps because it obscures the role of higher-order price terms on subjective valuations (as we explain more fully in subsequent paragraphs). Note

that risk and wealth levels, the other economic factors, do not appear to influence cash certainty equivalents.

Column (2) tries to shed some light on one of the behavioral factors underlying the general over-valuation of options noted earlier. In particular, the over-valuation of options in general raises the issue of whether participants view stock options as a lottery ticket. To address this issue, we computed the squared term and a cubed term of the expected stock price given by every participant. The idea is to employ the squared (cubed) term of the expected stock price as a proxy for the variance (skewness) in expected stock prices. If survey participants viewed options as lottery tickets, consistent with Golec and Tamarkin (1998), we expect to observe certainty equivalents to increase in the expected stock price and the skewness (or cubed transformation) of expected stock price and to decrease in variance (or the squared transformation) of stock price. Results reported in column (2) suggest that these expectations are borne out by the data. In particular, participants tend to value skewness in expected stock price. The coefficient on expected stock price is \$3,788.29 and significant (t-statistic = 1.84), and, as expected, the cubed transformation of expected stock price is positive and significant (coefficient = 0.68, t-statistic = 3.12). The coefficient on the squared transformation of the expected stock price is negative and significant (coefficient = -90.14, t-statistic = -2.31). Note that the adjusted R-squared jumps from 16% in column (1) to 35% in column (2) after the introduction of proxies for the lottery-ticket effect.

Column (3) introduces the demographic variables into the model. Apart from the lottery ticket effect, we find that current managers overvalue options by as much as \$7,726.73 (t-statistic = 1.67) relative to future entry-level managers. The R-squared for the full model in column (3) is 36%. Thus, a combination of economic, behavioral and demographic factors is associated with over-valuation of options.

### *3.6 Restricted stock base case*

To contrast managers' valuation of stock options with restricted stock, we create a case identical to the stock option base case, except that now the firm is offering participants a restricted stock package. In this restricted stock base case, the value of the restricted stock package is identical to the B-S value of the stock option package. Recall that the B-S value of the stock option package in the stock option base case is \$30,000 (3,000 options at \$10 per option). The equivalent restricted stock package is 1,000 shares at \$30 per share. The restricted stock vests in one year identical to the stock option base case. After reviewing the details of the restricted stock package, participants were asked what amount of cash they would require in exchange for the restricted stock package.

Results reported in Panel A of Table 4 show that the mean participant requires \$29,048.36 for the restricted stock package, which is not statistically different from the package's \$30,000 fair value. This suggests that participants on average correctly value the restricted stock relative to its fair value. Comparing the \$29,048 that participants required in the restricted stock base case to the \$38,681 they required in the stock option base case reveals that managers place a significantly smaller value on restricted stock than they do on stock options ( $p < 0.01$ ).

#### *3.6.1 What drives valuation of RS?*

Univariate correlations between the cash certainty equivalents for RS and participant characteristics suggest that participants who expected a higher subjective stock price valued RS higher (Pearson  $\rho = 0.46$ ,  $p < 0.01$ , two-tailed), consistent with economic theory. However, behavioral factors also matter. There is evidence that participants who understand how to value restricted stock ("RS ignorants") over-value RS (Spearman  $\rho = 0.14$ ,  $p = 0.07$ , two-tailed), and participants who have been granted RS in the past tend to discount the value of the RS package (Spearman  $\rho = -0.16$ ,  $p = 0.04$ , two-tailed). Multivariate regression results confirm the strong univariate association between subjective valuation of the RS package and expected stock price

(column 3: coefficient = 390.49, t-statistic = 5.81).<sup>12</sup> Interestingly, RS ignorant participants attach a \$3,365.41 higher subjective value to RS, which is approaching statistical significance (t-statistic = 1.55, p = 0.12, two-tailed). The adjusted R-squared for the full model in column (3) is 19%.

### *3.7 Summary of the option and RS results*

Managers over-value options relative to their B-S value and the equivalent restricted stock value. The over-valuation of options represents a lottery-ticket mentality in that participants display a fondness for the first-moment of expected subjective stock price of the firm and the cubed transformation of such price (proxy for skewness in stock price). Beyond the lottery-ticket effect, other behavioral factors tend to explain cross-participant variation in responses. There is some evidence that “option optimists” over-value options and “RS ignorants” assign a higher value to RS. Participants who expect the firm’s stock price to do well in the future also assign a higher value to the RS package.

Economic factors such as risk aversion and wealth levels do not appear to explain much of the variation in subjective valuations. More importantly, we find no evidence that for managers, firms incur a “deadweight” loss when issuing stock options, a result inconsistent with several papers that posit that risk-averse employees discount stock options (e.g., Lambert, Larcker and Verrecchia 1991, Meulbroek 2001 and Hall and Murphy 2002). In fact, our risk aversion measure or personal wealth levels never approach statistical significance in explaining subjective valuation of options, either in the univariate or multivariate analyses.<sup>13</sup>

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<sup>12</sup> Note that we did not introduce squared and cubed terms of expected stock price in the RS regression because a lottery ticket effect, for which these terms proxy, is more relevant in explaining over-valuation. Recall that our participants do not overvalue restricted stock.

<sup>13</sup> We recognize that this could reflect measurement issues with our risk aversion measure as opposed to the idea that risk aversion, the construct, is unrelated to subjective valuation of options.

The results are broadly consistent with (i) psychology-based theories of Taylor and Brown (1988) and Weinstein (1980) stating that participants over-value uncertain but positive expected outcomes (such as “leveraged” payoffs from options as opposed to those from restricted stock); (ii) evidence in Hallock and Olson (2004) that employees over-value options relative to B-S value; and (iii) the sentiment-based sorting stories proposed by Oyer and Schaefer (2004) and Bergman and Jenter (2004) which argue that if employees are optimistic about their employers’ prospects, they may prefer stock option grants to equally costly (from the firm’s fair value point of view) restricted stock grants. This suggests that firms can reduce the effective economic cost of compensation by granting stock options because employees value the options above their cost to the firm.

### *3.8 Interview evidence*

Interview evidence highlights four insights on why employees value options more than restricted stock. First, a middle-level executive pointed out that employees typically do not value restricted stock at a price substantially higher than the current market price because the employee can simply purchase the stock (although not restricted stock per se) from the market on his own account. However, long-term stock options that resemble employee stock options, with expiration dates ranging from five to 10 years from the date of issue, are rarely traded in capital markets. Hence, employees cannot readily purchase securities that resemble employee stock options on their own accounts. The firm is the sole supplier of its own stock options but not its actual stock, which can typically be purchased in the secondary market. Further, unlike stock, there is no ready exchange traded number that allows employees to calibrate subjective valuations of their stock options. Second, buying stock on his own account requires the employee to commit capital and bear the risk associated with locking the capital in the firm’s stock. However, options allow the employee to bear none of the risk associated with committing capital but offer

potentially amplified gains from rising stock prices in the future due to their “leverage” feature.<sup>14</sup> Because employees cannot replicate this leverage on their own account, they value stock options at a price higher than the B-S fair value.

Third, consistent with the sorting story suggested by Oyer and Schaefer (2004) and Bergman and Jenter (2004), a CFO commented that employees self select into “equity culture” companies. These firms typically attract more risk seeking employees, and their HR departments actively attempt to weed out individuals that would not thrive in such environments. One CFO elaborated that employees “who feel good about their option plans” are likely to be more motivated than average and are willing to try harder than average to be successful at their jobs. This statement is consistent with the assumptions in Oyer and Schaefer (2004) and Bergman and Jenter (2004) that an employee’s optimism in option valuation is likely correlated with his productivity.

Fourth, a controller states, “of the 1,000 employees in his firm who receive options, maybe 10 of them have heard of the B-S model.” All interviewees suggested that managers use a modified version of the intrinsic value method when valuing options. The *modified* intrinsic value is the *expected* price of the option in the *future* minus the option’s strike price.<sup>15</sup> Employees seem to project how the stock will do over some time period and then attach a value to the option package based on the difference between the projected stock price and the strike price.

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<sup>14</sup> The executive asked us to imagine a scenario where the stock price of the firm in our survey doubles from \$30 to \$60. In this case, the average employee has either 3,000 options issued at a strike price of \$30, or 1,000 shares of restricted stock with a current market price of \$30. The potential payoff from the stock options is \$90,000 [3,000 options \*(\$60-\$30)], whereas the potential payoff from the restricted stock is only \$60,000 [1,000 shares \*\$60]. Thus, in this scenario stock options dominate restricted stock. The leverage feature of stock options can of course hurt option holders if the stock price were to fall or stay flat in the future. An option holder would hold valueless options if on the expiration date the firm’s stock price had fallen to \$20 per share. However, a restricted stockholder would net \$20,000 (1000 \* \$20), even though the stock price has fallen by a third since the grant date.

<sup>15</sup> This CFO goes on to narrate a recent experience where he offered a new hire 5,000 options. That hire thought that the firm’s stock price would go to \$27 per share in the next three years and because the current stock price (which was also the strike price) was \$20, the option was worth \$7 each or a total of \$35,000. That hire thought that \$35,000 was not enough of a motivator to join the firm.

#### 4.0 Sensitivity of valuations to fair value inputs

In this section, we examine how managers change their subjective valuations of options and restricted stock in response to changes in the vesting date, expiration date, and the firm's stock price volatility.

##### 4.1 Vesting period and stock options

To examine the effect of changing the vesting date, we provide participants with a stock option package that is exactly the same as the stock option package offered in the base case with the exception that the vesting date is now three years from today rather than one year from today. After providing this information, we ask participants the amount of cash they would require in exchange for this new option package. Before presenting the results, we discuss our *ex ante* expectations related to how changing the vesting period will affect participants' subjective valuations.

##### *Economic factors*

If participants internalized that the B-S fair value of \$30,000 in the stock option base case (see section 3) is based on an employee holding the options until expiration, a change in the vesting date should have no effect on their subjective valuations. However, prior archival work suggests that employees exercise stock options soon after vesting (Huddart and Lang 1996, Heath, Huddart and Lang 1999). Hence, a risk-averse employee is likely to trade-off two conflicting possibilities when valuing options with a longer vesting date. On the one hand, the B-S based fair value of an option increases with expected term because the option has a higher chance of finishing in the money over a longer period of time. If postponing the vesting date were to postpone option exercise by two years, theoretically, participants should provide a higher certainty equivalent for the stock option package, all else constant. However, risk averse participants might prefer to lock in gains on the option and exercise the option sooner rather than

later. Hence, they may discount the certainty equivalent value of the option as a result of the delayed vesting date (relative to the base case).

#### *Behavioral factors*

The key behavioral theory related to vesting relates to hyperbolic discounting (Ainslie and Haslam 1992). The hyperbolic discounting explanation suggests that participants get more impatient for a positive reward (such as a large payoff from an option) as the time for making a decision about that reward draws near. In other words, employees will use a higher discount rate when valuing options that vest later relative to options that vest sooner. This suggests that participants will lower their valuation of options when the vesting date is extended.

#### *4.1.1 Results*

Panel A of Table 5 shows that the mean participant reports a cash exchange discount of \$3,938.15 relative to the base case and this discount is statistically different from zero. This discounting is consistent with three potential explanations: (i) under the economic framework, risk aversion dominates and participants discount options; and/or (ii) consistent with the hyperbolic discounting behavioral explanation, participants discount options when the date on which the option becomes theirs is pushed out into the future. Consistent with the economic explanation, univariate Spearman correlations suggest that wealthier participants discount options less (Spearman  $\rho = 0.22$ ,  $p = 0.02$  two-tailed) perhaps because they are less risk-averse. However, untabulated results reveal that participants discount the fair value of the option (the arms-length B-S value which ought to be insensitive to vesting date changes) by \$5,670 as well ( $p < 0.01$ ) when vesting is delayed. We suspect lack of understanding could also play a role because we would not expect participants to discount the fair value of the option on delayed vesting. Or, participants apply hyperbolic discounting to both the objective and subjective valuations of options. In sum, the discount in subjective valuations on delayed vesting is consistent with both economic and behavioral explanations.

One interpretation of the vesting related discount is that participants do not intend to hold the options for the full five-year term in the base case valuation discussed in section 3. If this is true, the subjective over-valuations we discuss in section 3 are likely understated because the benchmark used to compare the subjective valuations (i.e., the B-S value of \$30,000) in section 3 assumes employees hold the options full term. B-S values computed for a shorter expected term would be less than \$30,000.

Multivariate regressions are unsuccessful at explaining cross-participant variation in vesting related subjective valuation changes. Note that the adjusted r-squares of the full model is -2%. This suggests that the cross-participant variation in responses is perhaps too heterogenous to detect any significant effects. However, the main effect of a discount of \$3,938.15, reported in panel A, is robustly significant at the 0.02 level. In the tests to follow, we often encounter low adjusted r-squares when the dependent variable is the *change* in subjective valuations as opposed to the *levels* of subjective valuations reported in Tables 3 and 4. Thus, changes in subjective valuations are likely driven primarily by idiosyncratic factors specific to participants.

#### *4.1.2 Vesting period and restricted stock valuation*

For completeness, we also examine the effect of increasing the restricted stock vesting period from one year to three years. As reported in Panel A of Table 6, participants on average do not demand a premium, changing their subjective valuations by only \$57.85. Thus, participants do not revise their subjective valuations of restricted stock in response to a delay in vesting. Note further that the discount assigned to options when vesting is delayed is statistically larger than the slight premium assigned to restricted stock ( $\$3,938.15 > \$57.85$ ;  $p < 0.01$ ).

Turning to the cross-participant variation in the mean response to changes in RS values reveals the following patterns. Risk-seekers tend to discount less when vesting is delayed, consistent with economic theory (Spearman  $\rho = 0.17$ ,  $p = 0.03$ , two-tailed). RS optimists, representing behavioral factors, also discount less (Spearman  $\rho = 0.21$ ,  $p = 0.01$ , two-tailed). In

addition, participants who have been granted RS before discount more (Spearman  $\rho = -0.13$ ,  $p = 0.08$ , two-tailed). Turning to the multivariate results, we find that risk-seekers and RS optimists discount the value of the restricted stock package less when vesting is delayed. The above results suggest that a combination of economic and behavioral factors are modestly successful at explaining cross-participant variation in subjective valuations.

In sum, consistent with economic and behavioral theories, participants discount the cash certainty equivalents of options when vesting is delayed. In contrast, participants did not discount the cash certainty equivalent when restricted stock vesting is delayed.

#### *4.1.3 Interview evidence on vesting*

Our interviewees suggest that vesting is an important mechanism for retaining employees. One CFO refers to the vesting date as a “parole date,” and says “most employees don’t think they will stay with the company beyond the vesting date.” A controller argues that one of the key reasons for giving options to lower-level employees is to retain them. When we asked this executive why the vesting provision could not be introduced via a different compensation vehicle (such as a deferred bonus plan), he responded that options are the norm in labor markets where other employers grant them. He went on to state that lower-level managers in these markets expect to be given options almost as a foregone conclusion: “If the firm did not offer options in the Northwest U.S., given the presence of Microsoft in the region, then prospective employees would question if something is wrong with the company.” This explanation suggests that broad-based option usage might display geographical clustering. Another CFO mentions that options engender loyalty to the firm and employees fixate on the vesting date because options have a “tangible” value to the employee only after that. Until then, employees do not “own” the options, they merely have “theoretical” value. Salience of an item of information such as vesting date, of course, points towards a behavioral explanation for why employees discount subjective values of options when vesting is delayed.

#### *4.2 Manipulating option term*

To examine the effect of changing the expiration date of the options, we provide participants with a stock option package that is exactly the same as the stock option package offered in the base case with the exception that the expiration date is now ten years rather than five years. After providing this information, we ask participants for the amount of cash they would require in exchange for this new option package. Note that we do not ask a parallel question for restricted stock because restricted stock has no formal expiration date. The economic expectation is that participants will increase their subjective valuation of an option that expires at a later date.

Results reported in Panel A of Table 7 show that the mean participant values the extension in the option term at \$5,881.99 relative to the base-case, which is significantly greater than zero ( $p < 0.01$ ). This result is consistent with how economic models of option-pricing (e.g., the Black-Scholes model) would treat an extension in an option's term. Turning to cross-participant variation in responses, univariate correlation results suggest that demographic factors matter: males (Spearman  $\rho = 0.14$ ,  $p = 0.06$ , two-tailed) value extended expiration. Results also reveal that behavioral factors play a role. Participants who have been granted options before (Pearson  $\rho = 0.12$ ,  $p = 0.11$ , two-tailed) value term extensions, and interestingly, "option ignorants" (Spearman  $\rho = -0.23$ ,  $p < 0.01$ , two-tailed) dislike extended expiration dates. Economic explanations are not totally unimportant either as risk averse participants appear to view the extended term positively (Spearman  $\rho = -0.14$ ,  $p = 0.04$ , one-tailed). The multivariate regressions highlight the importance of "option ignorance" in explaining cross-participant variation in subjective valuation changes as a result of term extension. In particular, an "option ignorant" participant downgrades his subjective valuation by a substantial \$8,752.91 (t-statistic = -2.58) when the option term is extended.

### *4.3 Stock return volatility and option valuation*

#### *Economic factors*

Lambert, Larcker and Verrecchia (1991) show that the change in a risk-averse employee's certainty equivalent (i.e., the amount of cash he would require in exchange for his options) due to his firm's stock return volatility increasing can be decomposed into two parts. The first is the change in the fair value of the option, which is positive because the B-S value of an option increases with stock return volatility. The second is the increased risk premium demanded by the employee due to the concavity of his utility function. Which of these two effects dominate is an empirical question that we address in our survey. Prior literature, based largely on examining employees' exercise decisions, argues that the risk-aversion discount assigned to the value of options dominates the increased upside derived from stock return volatility. Huddart and Lang (1996) and Hemmer, Matsunaga and Shevlin (1996) find that increased stock return volatility is associated with early exercise, although early exercise can sometimes involve sacrificing a significant portion of the theoretical B-S value of an option held to maturity. Huddart and Lang (1996) suggest that the exercise decisions of lower-level employees demonstrate that they are more risk averse than higher-level employees. However, Bettis et al. (2005), relying on data from option exercises by corporate insiders and their assumed utility functions, find that subjective option values increase for the most part with higher stock return volatility.

#### *Behavioral factors*

Individuals often perceive risk as downside potential (March and Shapira 1987; Yates and Stone 1992; Heisler 1994; Olsen 1997), not necessarily as the variance of returns or the covariance of returns with the market. If participants view an increase in the variance of stock returns as an increase in downside potential, they may lower their subjective valuations of options. On the other hand, if they do not view an increase in a firm's stock return volatility as an

increase in downside potential and hence risk, they will likely ignore the increase in return volatility and leave their subjective valuations unchanged.

#### *Demographic factors*

Prior research has shown that women tend to invest more conservatively (Barber and Odean 2001; Jianakoplos and Benasek 1998) and view risk differently (Barksy et al. 1997; Olsen and Cox 2001) than men. These findings suggest that gender could potentially be a key variable in determining how individuals perceive a stock option's value when volatility increases.

To examine the effect of changing stock price volatility, we provide participants with a stock option package that is exactly the same as the stock option package offered in the base case with the exception that the firm's stock price volatility is now 50% rather than 30%. After providing this information, we ask participants for the amount of cash they would require in exchange for this new option package.

Panel A of Table 8 reports that, relative to the stock option base case where volatility was 30%, participants increased their certainty equivalent by an average of \$924.19 when volatility was 50%. However, that change is not significantly different from zero ( $p = 0.42$ ). Interestingly, in untabulated results, we find that the mean participant thought that the fair value of the option package increases by only \$1,260 when volatility increases, which is also not statistically different from zero. The increase in the B-S value of the option package when return volatility increases from 30% to 50% is \$14,430. Thus, participants think that the change in the "arms-length" fair value of an option is negligible, although the B-S model unambiguously predicts a large increase in the fair value of our option package in response to an increase in stock return volatility. Further, the similarity between participants' change in certainty equivalents (subjective values) and change in fair value estimates suggests that participants do not fully understand the impact of volatility increases on option values. The increase in the arms-length fair value of \$1,260 for the option package with 50% volatility is not statistically distinguishable from the increase in subjective valuation of \$924.19 ( $p = 0.31$ ). Consistent with this point, univariate

correlations show that “option ignorants” dislike increased volatility (Spearman  $\rho = -0.15$ ,  $p = 0.04$ , two-tailed). Contrary to expectations, gender is not significantly associated with changes in subjective valuations due to increased volatility. Multivariate results confirm that an “option ignorant” participant lowers his subjective valuation by \$5,711.19 (t-statistic = -2.06). These results suggest that the average non-response of subjective valuations to volatility increases is driven by ignorance about how options work.

#### *4.3.1 Restricted stock and stock return volatility*

For completeness, we also examine how managers react to increased stock return volatility with respect to restricted stock. To do so, we provide participants with a restricted stock package that is exactly the same as the restricted stock package offered in the base case with the exception that the firm’s stock price volatility is now 50% rather than 30%. We are interested in investigating whether managers understand that increased stock return volatility does not have a first-order effect on the fair value of restricted stock, assuming stock prices already incorporate the effect of such volatility. Results reported in Table 9 suggest that relative to the restricted stock base case, the mean manager increases his subjective valuation of restricted stock by \$105.30, which is not statistically different from zero ( $p = 0.88$ ). This finding is consistent with economic expectations. Univariate correlations suggest that the following participants increased their valuations of RS in response to increased volatility: (i) wealthier participants (Pearson  $\rho = 0.17$ ,  $p = 0.05$ , one-tailed) perhaps because they are less risk-averse (economic explanation); and (ii) RS optimists (Pearson  $\rho = 0.17$ ,  $p = 0.02$ , two-tailed) (behavioral explanation). Rank correlations suggest that risk-seekers also seem to respond positively to increased volatility (Spearman  $\rho = 0.12$ ,  $p = 0.06$ , one-tailed), consistent with economic theory. Taken together, a combination of economic and behavioral factors explain the cross-participant variation in subjective valuations (at least on a univariate basis). Multivariate regressions confirm that RS

optimists respond positively to increased stock return volatility. The adjusted r-squared of the full model in column (3) is a modest 2%.

## **5.0 Additional Analyses**

### *5.1 Stock price momentum*

Benartzi (2001), Liang and Weisbenner (2002) and Choi, Laibson, Madrian and Metrick (2004) find that when a firm's past stock returns increase, participants in 401(K) plans allocate more of their contributions to their firm's stock. Benartzi (2001) hypothesizes that employees extrapolate past returns when forming expectations about future returns. Heath, Huddart and Lang (1996) find that companies with longer-term share price increases (during days -15 to -60 relative to the exercise month) are less likely to experience exercises. These authors note that such option exercise patterns, especially for lower-level employees in broad-based plans, are consistent with employees believing that longer-term trends in stock prices will likely persist. Bergman and Jenter (2004) point out that valuing options from observed stock prices is difficult and likely beyond the capabilities of most employees. If employees do not know any other means by which to value stock options, then learning and extrapolating from past stock prices is a plausible heuristic.

To assess whether stock return momentum affects how employees value stock options we exposed participants to a scenario where Firm Z's stock price increased (decreased) 25% over the last six months from \$24 (\$40) per share to the current \$30 per share. We then told participants that analysts expect Firm Z's earnings to appreciate at 30% per annum over the next five years (the life of the options) in both the upward and downward return momentum scenarios.<sup>16</sup> The only difference between the two scenarios is Firm Z's stock price performance over the last six months. Managers, if uninfluenced by past return momentum, would value a stock option

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<sup>16</sup> As mentioned in footnote 9, we also ran a version where the growth rate in earnings was set at 5%. We do not separately report these results because inferences are qualitatively similar to those reported above. This suggests that our reported momentum results are not driven by those participants in the 30% version.

package under the two scenarios identically. If participants extrapolate past return momentum and ignore analysts' expectations of the firm's future performance, we expect participants to assign a higher (lower) value to the option package in the upward (downward) momentum scenario.

Results reported in Panel A of Table 10 suggest that the mean manager assigns a statistically significant incremental value (over the stock option base case) of \$5,290.91 to the stock option package in the upward momentum scenario ( $p < 0.01$ ). In the downward momentum scenario, managers assign an incremental value to the stock option package (over the base case) of only \$657.39, which is not significantly different from zero. The incremental increase in the upward momentum scenario is significantly greater than zero and is greater than the incremental change in the downward momentum scenario ( $p < 0.01$ ). Note that, as shown in Panel B, option ignorant participants respond positively to upward momentum (Spearman  $\rho = 0.13$ ,  $p = 0.08$  two-tailed). Multivariate regressions suggest that participants who have a higher percentage of their wealth in their firm's stock increase their subjective valuation of options in an up momentum case while those who have been granted options and "intrinsic value" users dislike downward momentum. Finally, future managers react more negatively to downward momentum than current managers.

We also investigate whether past stock return momentum influences how managers value restricted stock. Our restricted stock expectations are the same as our previously outlined stock option expectations. Results reported in panel A of Table 11 suggest that, relative to the restricted stock base case, managers assign a premium of \$5,322.33 in the upward momentum scenario ( $p < 0.01$ ), and a premium of \$816.60 in the downward momentum scenario, which is not significantly different from zero. The upward momentum premium is significantly greater than zero and is significantly greater than the downward momentum premium ( $p < 0.01$ ). Multivariate regressions suggest that participants with more wealth tied to their firm like upward momentum while future managers respond more to downward momentum than current managers. In sum,

our results suggest that managers appear to incorporate return trends, especially positive ones, into their subjective stock option and restricted stock valuations.

### *5.2 Interview evidence on training*

A consistent theme throughout the paper is that “option ignorant” participants tend to misvalue options. This finding begs the question why firms do not invest more resources in training employees? In the interviews, most CFOs and HR professionals admit that they do not invest significant time, effort and money in training employees on how to value stock options or restricted stock. Two CFOs mention that their firms usually just hand out the option plan document with information about black out dates and exercise procedures to each employee, but do not formally educate their employees on how to value options. Most of the information about how to value options is garnered via word of mouth discussions with other employees. Such word-of-mouth learning of course makes it easier for option valuation heuristics to spread “virally” within the firm and across firms. When we asked executives why they did not do more to educate employees, we typically received one of two responses. First, the firms did not want to cross the line into giving employees personal finance assistance. Second, the firms’ legal departments did not want HR officers to say anything about potential future stock prices for fear of getting sued, especially in the post-technology bubble environment.

Of course, another important reason to not invest in training might be strategic. If employees systematically over-value options, firms can effectively reduce their compensation costs by exploiting such over-valuation. A senior vice president of HR at a major company describes in detail how her firm uses options to create an “emotional connection” and a sense of pride among employees. This executive notes that “if we thought of options in terms of economic value, then we are not going to win the game.” She asserts that this emotional connection causes employees to assign a higher value to their options than the B-S value.

## 6.0 Conclusions

In this paper we report the results of a survey designed to ascertain how well managers understand stock options and restricted stock along with select interview comments from 12 executives. We find that a combination of economic and behavioral factors explain subjective valuations of options and restricted stock. We believe our survey and interview evidence contributes to the understanding of broad-based stock option and restricted stock plans on four dimensions. First, managers systematically over-value options relative to their B-S value and an equivalent restricted stock package. We find no evidence that managers discount the B-S value of an option casting doubt on whether firms really incur a “deadweight loss” when issuing options to middle-and lower-level employees. Our results suggest that, if anything, firms seem to extract a sentiment premium from employees for their options and hence lower their expected compensation expenses, consistent with recent work by Oyer and Schaefer (2004) and Bergman and Jenter (2004).

Second, managers reduce their subjective valuations of a stock option package when the vesting date is extended, but increase their subjective valuations when the expiration date is extended. Interviews support the notion that retention is an important motivation underlying the existence of broad-based option plans. Third, managers tend to extrapolate upward momentum in a firm’s stock price when subjectively valuing a stock option or restricted stock package. The leverage effect of stock options makes it attractive for firms to compensate employees with stock options when the firm experiences positive return momentum or future growth prospects. On the other hand, if employees perceive a firm’s future stock price growth to be flat or negative, firms (and their employees) may be better off issuing restricted stock. Finally, the mean manager does not seem to value the “convexity feature of stock options”– the incremental impact on an option’s value as a result of stock return volatility.

Our findings have implications for firms that are considering either a cutback in broad-based stock option plans, or a switch from options to restricted stock. Firms that abandon broad-

based option plans might lose the ability to attract employees optimistic about the firm's stock price and perhaps hence willing to work harder. Further, although the fair value of a call option is typically a third of a firm's stock price, employees might resist accepting a smaller number of restricted stock shares in place of options. Their resistance is likely to be especially high (due to the leverage effect of options) if they believe past positive return momentum in the firm's stock price will likely continue, or if they believe that the firm's future growth prospects are good. Our data also indicate that employee education about how options and restricted stock work could potentially mitigate misvaluation errors. Of course, firms might have little incentive to correct systematic employee over-valuation of broad-based options.

In sum, our results suggest that (i) over 40% of managers value options at greater than their B-S value and such managers view options as a "lottery ticket"; (ii) exchanging options for an economically equivalent package of restricted stock is not seen as a "fair" deal; (iii) managers value quick vesting; and (iv) managers place a premium on the value of an option (over its B-S value) when future stock price expectations are high; and when the firm experiences recent upward price momentum. We believe future research can fruitfully explore the implications of these findings for firms' broad-based equity compensation by developing new theories, or expanding existing theories, on why broad-based plans exist. Practitioners could learn from our results and tailor equity plans to suit their employees' economic, behavioral and demographic profiles.

## References

- Ainslie, G. and N. Haslam. 1992. Hyperbolic discounting. G. Lowenstein and J. Elster. *Choice over Time*. New York: Russel Sage Foundation: 57-92.
- Barber, B., and T. Odean. 2001. Boys will be boys: Gender, overconfidence, and common stock investment. *Quarterly Journal of Economics* (February): 261-292.
- Barsky, R., T. Juster, M. Kimball, and M. Shapiro. 1997. Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study. *Quarterly Journal of Economics* 112: 537-579.
- Benartzi, S. 2001. Excessive extrapolation and the allocation of company stock to retirement accounts. *Journal of Finance* 56(5): 1747-1764.
- Bergman, N. and D. Jenter. 2004. Employee sentiment and stock option compensation. Working paper, Massachusetts Institute of Technology.
- Bettis, J., J. Bizjak and M. Lemmon. 2005. Exercise behavior, valuation, and the incentive effects of employee stock options. *Journal of Financial Economics* (forthcoming).
- Brav, A., J.R. Graham, C.R. Harvey and R. Michaely. 2005. Payout policy in the 21<sup>st</sup> century. *Journal of Financial Economics* (forthcoming).
- Choi, J., D. Laibson, B. Madrian and A. Metrick. 2004. Employees' investment decisions about company stock. NBER paper no.10228.
- Core, J. and W. Guay. 2001. Stock option plans for non-executive employees. *Journal of Financial Economics* 61(2): 253-87
- Core, J., W. Guay and D. Larcker. 2003. Executive Equity Compensation and Incentives: A Survey. Federal Reserve Bank New York Economic Policy Review: April 9(1).
- Deloitte. 2005. *Options Take a Hit, but What Will Take Their Place?* The 2005 Deloitte Stock Compensation Survey. Deloitte Development LLC.
- Demsetz, H. and K. Lehn. 1985. The structure of corporate ownership: causes and consequences, *Journal of Political Economy* 93: 1155-1177.
- Fidelity Investments. 2003. Maximizing Employee Stock Option Plans.
- Gilovich, T., D. Griffin, and D. Kahneman. 2002. *Heuristics and Biases*. Cambridge, United Kingdom: Cambridge University Press.
- Golec, J. and M. Tamarkin. 1998. Bettors love skewness, not risk, at the horse track. *The Journal of Political Economy* 106(1): 205-225.

- Graham, J.G., C.R. Harvey and S. Rajgopal. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* (forthcoming).
- Hall, B.J., and K.J. Murphy, K.J., 2002. Stock options for undiversified executives. *Journal of Accounting and Economics* 33: 3–42.
- Hallock, K. and C. Olson. 2004. The value of stock options to non-executive employees. Working paper, University of Illinois at Urbana Champaign.
- Heath, C., S. Huddart, and M. Lang. 1999. Psychological factors and stock option exercise. *Quarterly Journal of Economics* 114(2) (May): 601–628.
- Heisler, J. 1994. Loss aversion in a futures market: An empirical test. *Review of Futures Markets* 13: 793-822.
- Hemmer, T., S. Matsunaga, and T. Shevlin. 1994. Estimating the ‘fair value’ of employee stock options with expected early exercise. *Accounting Horizons* 8 (December): 23–42.
- Huddart, S. and M. Lang, M., 1996. Employee stock option exercises: an empirical analysis. *Journal of Accounting and Economics* 21: 5–43.
- Jensen, N, K. Murphy and E. Wruck. 2004. Remuneration: Where we've been, how we got to here, what are the problems, and how to fix them. Working paper, Harvard Business School.
- Jianakoplos, N. and A. Bernasek. 1998. Are women more risk averse? *Economic Inquiry* (October): 620-630.
- Kahneman, D. and A. Tversky. 1979. Prospect theory: An analysis of decision under Risk. *Econometrica* 47: 263-291
- Kedia, S. and Mozumdar, A.: 2002, Performance impact of employee stock options. Working Paper, Harvard Business School.
- Kim, D.C. 1992. Risk preferences in participative budgeting. *The Accounting Review* 67(2): 303-318.
- Lambert, R. and D. Larcker, 2001, How employees value (often incorrectly) their stock options, Knowledge@Wharton Online Article, available at <http://knowledge.wharton.upenn.edu/index.cfm?fa=viewArticle&id=363>, May.
- Lambert, R., D. Larcker and R. Verrecchia. 1991. Portfolio considerations in valuing executive compensation. *Journal of Accounting Research*; 29(1): 129-49.
- Liang, N. and S. Weisbenner. 2002. Investor behavior and the purchase of company stock in 401(k) plans – The importance of plan design. Working paper, University of Illinois at Urbana Champaign.

- March, J., and Z. Shapira. 1987. Managerial perspectives on risk and risk taking. *Management Science* 33 (November): 1404-1418.
- Meulbroeck, L. 2001. The efficiency of equity-linked compensation: Understanding the full cost of awarding executive stock options. *Financial Management*, 30 (Summer): 5-30.
- Miller, N. and D. Campbell. 1959. Recency and primacy in persuasion as a function of the timing of speeches and measurements. *Journal of Abnormal and Social Psychology* 59: 1-9.
- Olsen, R. 1997. Investment risk: The experts' perspective. *Financial Analysts' Journal* 53 (March/April): 62-66.
- Olsen, R. and M. Cox. 2001. The influence of gender on the perceptions and response to investment risk: The case of professional investors. *The Journal of Psychology and Financial Markets* 2: 29-36.
- Oyer, P., 2004. Why do firms use incentives that have no incentive effects? *Journal of Finance* 59: 1619-1640.
- Oyer, P. and S.Schaefer. 2004. Why do some firms give stock options to all employees? An empirical examination of alternative theories. *Journal of Financial Economics* (forthcoming).
- Sheng, E. 2005. Stock option cuts to hit employees in lower ranks. *Wall Street Journal* July 13, 2005.
- Taylor, S. and J. Brown. 1988. Illusion of well-being: A social psychological perspective on mental health. *Psychological Bulletin* 103(2):193-210.
- Trahan, E. and L. Gitman. 1995. Bridging the theory-practice gap in corporate finance. A survey of Chief Financial Officers. *Quarterly Review of Economics and Finance* 35: 73-87.
- Weinstein, N. 1980. Unrealistic optimism about future life events. *Journal of Personality and Social Psychology* 39(5): 806-820.
- Yates, F., and E. Stone. 1992. The risk construct. In *Risk-Taking Behavior*, edited by F. Yates. New York, NY: John Wiley & Sons: 1-25.

**Table 1**  
**Descriptive statistics**

**Panel A: Demographic characteristics<sup>1</sup>**

	<i>Column 1</i>	<i>Column 2</i>		<i>Column 1</i>	<i>Column 2</i>
	<b>Current</b>	<b>Future</b>		<b>Current</b>	<b>Future</b>
	<b>Managers</b>	<b>Managers</b>		<b>Managers</b>	<b>Managers</b>
	Percent	Percent		Percent	Percent
<b>Type of participants</b>	<i>n = 79</i>	<i>n = 113</i>	<b>Considering your current/anticipated job, how long do you expect to work for the firm</b>	<i>n = 76</i>	<i>n = 107</i>
Daytime MBA		100.0%	< 4 yrs	42.1%	37.4%
Evening MBA	31.6%		4 - 7 yrs	23.7%	46.7%
Executive MBA	68.4%		> 7 yrs	34.2%	15.9%
Computer science			Mean (yrs)	7.5	5.8
Engineering			Median (yrs)	5.0	5.0
Other					
<b>Age</b>	<i>n = 75</i>	<i>n = 111</i>	<b>Type of degree / certification</b>	<i>n = 76</i>	<i>n = 111</i>
< 28 yrs	9.3%	37.8%	Undergrad degree	100.0%	100.0%
28 - 34 yrs	48.0%	50.5%	Graduate degree	32.9%	52.3%
> 34 yrs	42.7%	11.7%	CPA	2.6%	2.7%
Mean (yrs)	34.4	29.1			
Median (yrs)	33.0	29.0			
<b>Gender</b>	<i>n = 76</i>	<i>n = 111</i>	<b>Risk preferences<sup>2</sup></b>	<i>n = 74</i>	<i>n = 110</i>
Female	19.7%	28.8%	Risk averse (<50)	60.8%	42.7%
Male	80.3%	71.2%	Risk neutral (=50)	17.6%	24.5%
			Risk seeking (>50)	21.6%	32.8%
<b>Work experience</b>	<i>n = 74</i>	<i>n = 111</i>	<b>Time to complete task</b>	<i>n = 59</i>	<i>n = 94</i>
zero	0.0%	2.7%	Mean (minutes)	26.0	32.0
1 - 4 yrs	5.4%	38.7%	Median (minutes)	25.0	24.0
5 - 10 yrs	40.5%	52.3%			
> 10 yrs	54.1%	6.3%	<b>What was your expectation of Firm Z's future stock price?</b>	<i>n = 58</i>	<i>n = 96</i>
Mean (yrs)	12.2	5.6	Less than today's stock price	5.2%	5.2%
Median (yrs)	11.0	5.0	Equal to today's stock price	22.4%	34.4%
<b>Type of work experience</b>	<i>n = 76</i>	<i>n = 111</i>	More than today's stock price	72.4%	60.4%
Accounting / Finance	26.3%	34.2%	Mean (\$)	36.70	35.80
Consulting	26.3%	18.9%	Median (\$)	35.00	32.50
Marketing / Sales	32.9%	29.7%			
Operations / Production	35.5%	20.7%			
Human resources	13.2%	7.2%			
Engineering	32.9%	18.0%			
Computer programming	27.6%	17.1%			

Notes:

<sup>1</sup>Frequencies are based on non-missing observations.

<sup>2</sup>See Panel B of Table 1 for the question we used to capture participants' risk preferences.

# Table 1

## Descriptive statistics

### Panel A (cont.): Demographic characteristics<sup>1</sup>

	<i>Column 1</i>	<i>Column 2</i>		<i>Column 1</i>	<i>Column 2</i>
	<b>Current</b>	<b>Future</b>		<b>Current</b>	<b>Future</b>
	<b>Managers</b>	<b>Managers</b>		<b>Managers</b>	<b>Managers</b>
	Percent	Percent		Percent	Percent
<b>Experience with res. stock / options</b>	<i>n</i> = 76	<i>n</i> = 111	<b>How do you think your firm's stock will perform over the next year</b>	<i>n</i> = 47	<i>n</i> = 23
Granted restricted stock	23.7%	9.9%	Increase	74.5%	69.6%
Granted stock options	68.4%	26.1%	Decrease	4.3%	13.0%
Exercised stock options	34.2%	10.8%	No change	21.2%	17.4%
Number of times exercised:			Percent increase		
zero	67.1%	89.2%	Mean	26.4%	13.4%
1 - 5	25.0%	9.9%	Median	10.0%	10.0%
> 5	7.9%	0.9%	Percent decrease		
			Mean	6.5%	11.3%
			Median	6.5%	11.3%
<b>Are options in / out of the money</b>	<i>n</i> = 39	<i>n</i> = 11			
In the money	46.2%	36.4%	<b>Wealth (\$)</b>	<i>n</i> = 57	<i>n</i> = 48
Out of the money	25.6%	45.5%	< 20,000	5.3%	43.8%
Both	28.2%	18.1%	20,000 - 49,000	3.5%	6.3%
			50,000 - 99,000	14.0%	22.9%
<b>Firms that participants have an equity interest in</b>	<i>n</i> = 44	<i>n</i> = 27	100,000 - 299,000	35.1%	16.7%
Number of different firms	25.0	25.0	300,000 - 499,000	22.8%	2.1%
Specific firms:			>= 500,000	19.3%	8.3%
Amazon		1.8%			
Boeing	7.6%		<b>Percentage of wealth in firm</b>	<i>n</i> = 53	<i>n</i> = 37
Fujitsu			0%	17.0%	37.8%
Intel		1.8%	1% - 15%	32.1%	37.9%
Microsoft	13.9%	1.8%	> 15%	50.9%	24.3%
Proten Devices			mean	13.1%	9.0%
Washington Mutual	3.8%		median	6.0%	2.0%
Other	74.7%	94.6%			
			<b>How would you describe your understanding of stock options?</b>	<i>n</i> = 74	<i>n</i> = 111
<b>Length of employment at above firms</b>	<i>n</i> = 44	<i>n</i> = 27	1 (very poor)	31.1%	38.7%
< 4 yrs	25.0%	59.3%	2	27.0%	27.9%
4 - 7 yrs	29.5%	29.6%	3	24.3%	17.1%
> 7 yrs	45.5%	11.1%	4	16.2%	14.4%
Mean (yrs)	8.3	4.5	5 (very good)	1.4%	1.8%
Median (yrs)	5.8	3.5	Mean	2.3	2.1
			Median	2.0	2.0
<b>How has your firm's stock performed in 2004</b>	<i>n</i> = 47	<i>n</i> = 23	<b>How would you describe your understanding of restricted stock?</b>	<i>n</i> = 74	<i>n</i> = 111
Increased	53.2%	52.2%	1 (very poor)	40.5%	53.2%
Decreased	17.0%	21.7%	2	36.5%	25.2%
Has not changed	29.8%	26.1%	3	9.5%	11.7%
			4	12.2%	9.0%
Percent increased	<i>n</i> = 23	<i>n</i> = 9	5 (very good)	1.4%	0.9%
Mean	22.7%	22.2%	Mean	2.0	1.8
Median	20.0%	14.0%	Median	2.0	1.0
Percent decreased	<i>n</i> = 7	<i>n</i> = 4			
Mean	37.9%	31.3%			
Median	30.0%	27.5%			

Notes:

<sup>1</sup>Frequencies are based on non-missing observations. For example, 25 of the 47 participants (53.2%) who answered the "How has your firm's stock performed in 2004" question indicated "increased." However, only 23 of these participants provided an answer to the "percent increased" question.

**Table 1**  
**Variable Legend**

**Panel B: Variable Definitions:**

<i>Variable</i>	<i>Question</i>
<b>Risk preferences</b>	Would you be willing to participate in a gamble where you have a 50 percent chance of winning \$10 and a 50 percent chance of losing \$10, or would you prefer not to play the gamble?" Participants responded by marking a scale with endpoint labeled "0 = extreme unwillingness (no gamble)" and "100 = extreme willingness (gamble)." The midpoint was labeled "no preference." We classify those that answered less than 50 as risk averse (0), equal to 50 as risk neutral (1), and greater than 50 as risk seeking (2).
<b>Wealth level</b>	Please indicate the range that best describes your wealth? Participants responded by checking one of the following categories: less than \$20,000; \$20,000 - \$49,000; \$50,000 - \$99,000; \$100,000 - \$299,000; \$300,000 - \$499,000; \$500,000 and above.
<b>Wealth percent</b>	Please approximate the percentage of your wealth tied up in the firm's equity (e.g., stock, vested or unvested stock options, restricted stock). Participants responded by providing a percentage between 0 - 100.
<b>Firm Z's expected stock price</b>	In thinking about the amount of cash you required in exchange for the stock option base case package, what was your expectation of Firm Z's future stock price? We classify those below (above) the median response as low (high).
<b>Option optimist</b>	1 if any of pre-case quiz responses indicate that an option's value is greater than the Black-Scholes value, zero otherwise
<b>Restricted stock optimist</b>	1 if any of pre-case quiz responses indicate that a share of restricted stock is worth more than today's stock price, zero otherwise
<b>Option ignorant</b>	1 if any pre-case quiz responses indicate that "at the money" options have no value, underwater options have negative values, or an option's value is equal to today's stock price, zero otherwise
<b>Restricted stock ignorant</b>	1 if any pre-case quiz responses indicate that the value of a share of restricted stock is zero or negative, zero otherwise
<b>Granted options / restricted stock</b>	Have you ever been granted stock options or restricted stock? Participants responded by marking a box labeled "Yes, I have been granted stock options," or "Yes, I have been granted restricted stock," or "No, I have not been granted stock options or restricted stock."
<b>Intrinsic</b>	1 if any pre-quiz responses indicate that the value of an option is equal to today's stock price less the option's exercise price, zero otherwise.
<b>Gender</b>	What is your gender? Participants responded by marking a box labeled "Female" or "Male."
<b>Age</b>	What is your age? Participants responded by filling in a blank followed by the label "years."
<b>Current / future manager</b>	1 if a participant is an executive or evening MBA student (current manager), zero if a participant is a daytime MBA student (future manager)

**Table 2****Ease of understanding: Approximate fair value of one share of restricted stock and one stock option**

Question: Please approximate the fair value today (i.e., the amount that a share of restricted stock or a stock option could be bought or sold for between independent parties in an active market) of one share of vested restricted stock and one vested stock option when the firm's stock prices is as follows: \$5, \$15, \$20, \$25, \$40. We provided participants with the following information: Grant date = today; Vesting date = today; Expiration date = 2 years from today; Exercise price = \$20; Risk-free interest rate = 4%; Stock price volatility = 30 percent.

**Panel A: Fair value of one share of restricted stock (n = 188)**

<i>Today's stock price</i>	<i>\$5.00</i>	<i>\$15.00</i>	<i>\$20.00</i>	<i>\$25.00</i>	<i>\$40.00</i>
<i>Fair value</i>	<i>\$5.00</i>	<i>\$15.00</i>	<i>\$20.00</i>	<i>\$25.00</i>	<i>\$40.00</i>
Mean (\$)	4.55	12.84	17.13	22.07	36.01
Median (\$)	5.00	15.00	20.00	25.00	40.00
Mode (\$)	5.00	15.00	20.00	25.00	40.00
Percent correct	62.6%	63.6%	66.7%	64.0%	63.0%
Percent less than correct	24.6%	27.3%	24.3%	28.0%	28.0%
Percent more than correct	12.8%	9.1%	9.0%	8.0%	9.0%

**Panel B: Fair value of one stock option (n = 188)**

<i>Today's stock price</i>	<i>\$5.00</i>	<i>\$15.00</i>	<i>\$20.00</i>	<i>\$25.00</i>	<i>\$40.00</i>
<i>Black Scholes fair value</i>	<i>\$0.00</i>	<i>\$1.40</i>	<i>\$4.06</i>	<i>\$7.79</i>	<i>\$21.69</i>
Mean (\$)	1.49	5.75	9.63	13.92	27.36
Median (\$)	0.15	2.00	5.00	9.00	22.00
Mode (\$)	0.00	0.00	0.00	5.00	20.00
Less than zero	10.6%	10.6%	0.0%	0.0%	0.0%
Zero	34.0%	29.2%	34.0%	2.6%	2.1%
Intrinsic value (P - X)	9.6%	10.6%	34.0%	31.7%	32.3%
Exercise price (\$20)	2.1%	3.7%	24.5%	4.8%	32.3%
Today's stock price	17.0%	18.1%	24.5%	18.5%	18.5%
Less than Black Scholes	10.6%	46.3%	48.4%	47.6%	48.7%
Greater than Black Scholes	55.4%	53.2%	51.1%	52.4%	50.8%

**Table 3**  
**STOCK OPTION BASE CASE: Cash required in exchange for the option package**

Assume you are about to graduate and have tentatively decided to go to work for Firm Z. Firm Z is in good financial condition, and the consensus long-term analyst forecasts for Firm Z projects a 30 percent annual increase in earnings (which is considered "high" growth in this industry) over the next five years. As compensation, Firm Z is offering you a base salary of \$80,000, plus a stock option package. You plan to work for Firm Z long enough for the stock options to vest (i.e., at least one year). Details of the stock option package Firm Z is offering are as follows: Number of options: 3,000; Grant date: today; Vesting date: 1 year from today; Expiration date: 5 years from today; Stock price today: \$30 per share Exercise price: \$30 per share; Risk-free interest rate: 4 percent; Stock price volatility: 30 percent; Fair value: \$10 per option (\$30,000 for package)

**Panel A: Questions and descriptive statistics ①**

<i>Question</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt;\$30,000</i>	<i>= \$30,000</i>	<i>&gt;\$30,000</i>
Approximately what amount of cash would you require in exchange for the option package?	188	\$38,681.71	\$24,687.61	\$30,000.00	24.5%	34.0%	41.5%

**Panel B: Univariate correlations**

<i>Independent variables</i>	<i>Pearson</i>			<i>Spearman</i>		
	<i>Required cash</i>	<i>p-value</i>		<i>Required cash</i>	<i>p-value</i>	
Risk preference	-0.03	0.72		0.05	0.53	
Wealth level	-0.06	0.58		-0.06	0.53	
Wealth percent	-0.04	0.71		-0.13	0.23	
Expected price	<b>0.43</b>	<b>0.00</b>	***	<b>0.16</b>	<b>0.04</b>	**
Expected price <sup>2</sup>	<b>0.51</b>	<b>0.00</b>	***	<b>0.16</b>	<b>0.04</b>	**
Expected price <sup>3</sup>	<b>0.57</b>	<b>0.00</b>	***	<b>0.16</b>	<b>0.04</b>	**
Option optimist	0.09	0.20		<b>0.17</b>	<b>0.02</b>	**
Option ignorant	0.07	0.36		0.02	0.83	
Granted options	-0.10	0.19		-0.06	0.43	
Intrinsic	-0.08	0.31		-0.11	0.15	
Gender	-0.05	0.48		-0.05	0.48	
Age	-0.06	0.44		-0.06	0.39	
Current/future manager	0.01	0.88		0.02	0.81	

**Panel C: Multiple regression**

	<i>Model 1: economic factors</i>		<i>Model 2: behavioral factors</i>		<i>Model 3: demographic factors</i>	
	<i>Coefficient</i>	<i>t-statistic</i>	<i>Coefficient</i>	<i>t-statistic</i>	<i>Coefficient</i>	<i>t-statistic</i>
Constant	3,626.04	0.48	-18,268.47	-0.54	-11,688.12	-0.33
Risk preference	3,626.04	-0.49	260.39	0.12	748.01	0.34
Wealth dummy	-1,137.50	-0.16	-1,247.68	-0.20	-762.98	-0.12
Wealth level	-1,183.30	-0.22	552.74	0.35	54.34	0.03
Wealth percent	-384.80	0.06	-16.98	-0.12	-32.06	-0.23
Expected price	<b>9.23</b>	<b>5.65</b> ***	<b>3,788.29</b>	<b>1.84</b> *	<b>3,983.26</b>	<b>1.94</b> **
Expected price <sup>2</sup>			<b>-90.14</b>	<b>-2.31</b> **	<b>-93.09</b>	<b>-2.39</b> **
Expected price <sup>3</sup>			<b>0.68</b>	<b>3.12</b> ***	<b>0.69</b>	<b>3.20</b> ***
Option optimist			7,475.15	1.36	7,056.43	1.26
Option ignorant			6,401.28	1.49	5,091.12	1.17
Granted options			-2,002.95	-0.48	-3,119.44	-0.74
Intrinsic			-5,942.66	-1.01	-6,326.77	-1.07
Gender					-5,580.58	-1.35
Age					-235.81	-0.69
Current/future Manager					<b>7,726.73</b>	<b>1.67</b> *
N	150		149		149	
Adjusted r-squared	16%		35%		36%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

① In this table and henceforth, we truncate the top/bottom 1% due to extreme outliers.

② \$38,681.71 > \$30,000; p < 0.01

**Table 4****RESTRICTED STOCK BASE CASE: Cash required in exchange for the restricted stock package**

Continue to assume that you are about to graduate and have tentatively decided to go to work for Firm Z. Recall that Firm Z is in good financial condition, and that the consensus long-term analyst forecasts for Firm Z projects a 30 percent annual increase in earnings (which is considered "high" growth in this industry) over the next five years. As compensation, Firm Z is now offering you a base salary of \$80,000, plus a **restricted stock** package. You plan to work for Firm Z long enough for the shares of restricted stock to vest (i.e., at least one year). Details of the restricted stock package Firm Z is offering are as follows: Number of shares of restricted stock: 1,000; Grant date: today; Vesting date: 1 year from today; Stock price today: \$30 per share; Risk-free interest rate: 4 percent; Stock price volatility: 30 percent.

**Panel A: Questions and descriptive statistics**

<i>Question</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt;\$30,000</i>	<i>=\$30,000</i>	<i>&gt;\$30,000</i>
Approximately what amount of cash would you require in exchange for the restricted stock package?	188	\$29,048.36	\$8,990.92	\$30,000.00	37.0%	39.2%	23.8%

① ②

**Panel B: Univariate correlations**

<i>Independent variables</i>	<i>Pearson</i>			<i>Spearman</i>		
	<i>Required cash</i>	<i>p-value</i>		<i>Required cash</i>	<i>p-value</i>	
Risk preference	-0.07	0.40		0.02	0.84	
Wealth level	0.00	0.99		0.04	0.73	
Wealth percent	0.02	0.87		0.02	0.83	
Expected price	<b>0.46</b>	<b>0.00</b>	***	<b>0.20</b>	<b>0.02</b>	**
Restricted stock optimist	-0.08	0.27		-0.06	0.39	
Restricted stock ignorant	0.12	0.11		<b>0.14</b>	<b>0.07</b>	*
Granted restricted stock	-0.10	0.17		<b>-0.16</b>	<b>0.04</b>	**
Gender	0.04	0.63		-0.01	0.95	
Age	0.01	0.89		0.04	0.65	
Current/future manager	0.03	0.69		0.10	0.19	

**Panel C: Multiple regression**

	<i>Model 1: economic factors</i>		<i>Model 2: behavioral factors</i>		<i>Model 3: demographic factors</i>	
	<i>Coefficient</i>	<i>t-statistic</i>	<i>Coefficient</i>	<i>t-statistic</i>	<i>Coefficient</i>	<i>t-statistic</i>
Constant	<b>14,542.15</b>	<b>5.48</b> ***	<b>15,356.77</b>	<b>5.60</b> ***	<b>17,505.63</b>	<b>3.48</b> ***
Risk preference	-897.68	-1.08	-972.36	-1.15	-865.43	-0.98
Wealth dummy	1,767.73	0.71	1,600.01	0.64	1,554.99	0.61
Wealth level	-127.73	-0.21	-88.36	-0.14	-128.78	-0.19
Wealth percent	-7.72	-0.14	-10.20	-0.19	-13.65	-0.25
Expected price	<b>399.82</b>	<b>6.15</b> ***	<b>383.04</b>	<b>5.83</b> ***	<b>390.49</b>	<b>5.81</b> ***
Restricted stock optimist			-1,782.83	-0.94	-2,002.23	-1.04
Restricted stock ignorant			3,275.16	1.53	3,365.41	1.55
Granted restricted stock			-1,399.70	-0.68	-1,542.50	-0.74
Gender					-1,102.11	-0.65
Age					-60.95	-0.44
Current/future manager					1,077.94	0.58
N	143		142		142	
Adjusted r-squared	20%		20%		19%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

① \$29,048.36 vs. \$30,000; p = 0.156

② \$29,048.36 < \$38,681.71 (cash required for the option package, see Table 3); p < 0.01

**Table 5****Stock options: Change in cash required for the option package when the VESTING DATE is extended**

Recall that under the original stock option details the vesting date was one year from today. Now consider an ALTERNATE option package where all of the original details remain exactly the same, except that the vesting date is 3 years from today.

**Panel A: Questions and descriptive statistics**

<i>Question</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt; original</i>	<i>= original</i>	<i>&gt; original</i>
Change in the amount of cash required for this package relative to the original option package.	182	\$ (3,938.15)	\$ 15,872.24	\$ (3,000.00)	57.7%	16.5%	25.8%

**Panel B: Univariate correlations**

<i>Independent variables</i>	<u>Pearson</u>		<u>Spearman</u>		
	<i>Change in cash</i>	<i>p-value</i>	<i>Change in cash</i>	<i>p-value</i>	
Risk preference	0.10	0.17	0.09	0.23	
Wealth level	0.09	0.39	<b>0.22</b>	<b>0.02</b>	**
Wealth percent	-0.12	0.29	-0.01	0.89	
Option optimist	0.05	0.47	0.08	0.27	
Option ignorant	-0.08	0.30	0.01	0.85	
Granted options	-0.12	0.13	-0.11	0.16	
Intrinsic	-0.06	0.43	-0.03	0.65	
Gender	-0.05	0.53	-0.04	0.59	
Age	0.01	0.88	0.03	0.70	
Current/future manager	-0.01	0.88	0.02	0.79	

**Panel C: Multiple regression**

	<u>Coefficient</u>	<u>t-statistic</u>
Constant	446.33	0.05
Risk preference	1,712.21	1.15
Wealth dummy	-5,185.26	-1.22
Wealth level	1,474.33	1.35
Wealth percent	-57.81	-0.59
Option optimist	-1,063.49	-0.26
Option ignorant	-1,971.81	-0.69
Granted options	-4,035.44	-1.45
Intrinsic	-464.90	-0.12
Gender	-2,128.23	-0.74
Age	-1.23	-0.01
Current/future manager	1,554.78	0.49
N	171	
Adjusted r-squared	-2%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

① -\$3,938.15 < 0; p < 0.02

**Table 6****Restricted stock: Change in cash required for the restricted stock package when the VESTING DATE is extended**

Recall that under the original restricted stock details the vesting date was one year from today. Now consider an ALTERNATE restricted stock package where all of the original details remain exactly the same, except that the vesting date is 3 years from today.

**Panel A: Questions and descriptive statistics**

<i>Question</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt; original</i>	<i>= original</i>	<i>&gt; original</i>
Change in the amount of cash required for this package relative to the original restricted stock package.	179	\$ 57.85	\$ 9,188.31	\$ (1,000.00)	52.0%	19.0%	29.0%
		<b>❶</b>					
		<b>❷</b>					

**Panel B: Univariate correlations**

<i>Independent variables</i>	<u>Pearson</u>			<u>Spearman</u>		
	<i>Change in cash</i>	<i>p-value</i>		<i>Change in cash</i>	<i>p-value</i>	
Risk preference	<b>0.14</b>	<b>0.06</b>	*	<b>0.17</b>	<b>0.03</b>	**
Wealth level	0.01	0.95		0.02	0.89	
Wealth percent	-0.04	0.74		-0.13	0.25	
Restricted stock optimist	<b>0.26</b>	<b>0.00</b>	***	<b>0.21</b>	<b>0.01</b>	***
Restricted stock ignorant	0.08	0.31		0.08	0.28	
Granted restricted stock	<b>-0.13</b>	<b>0.08</b>	*	<b>-0.13</b>	<b>0.08</b>	*
Gender	0.00	0.96		-0.01	0.92	
Age	0.08	0.32		0.06	0.44	
Current/future manager	0.01	0.91		-0.01	0.94	

**Panel C: Multiple regression**

	<u>Coefficient</u>	<u>t-statistic</u>
Constant	-7,143.63	-1.63
Risk preference	<b>1,575.17</b>	<b>1.93</b> *
Wealth dummy	-65.26	-0.03
Wealth level	43.66	0.07
Wealth percent	-34.43	-0.63
Restricted stock optimist	<b>6,230.27</b>	<b>3.35</b> ***
Restricted stock ignorant	1,486.11	0.73
Granted restricted stock	-2,111.24	-1.10
Gender	865.55	0.55
Age	152.03	1.14
Current/future manager	738.29	0.44
N	169	
Adjusted r-squared	6%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

❶ \$57.85 vs 0; p = 0.93

❷ \$57.85 > -\$3,938.15 (change for option package, see Table 5); p < 0.01

**Table 7****Stock options: Change in cash required for the option package when the EXPIRATION DATE is extended**

Recall that under the original stock option details the expiration date was 5 years from today. Now consider an ALTERNATE option package where all of the original details remain exactly the same, except that the expiration date is 10 years from today.

**Panel A: Questions and descriptive statistics**

<i>Question</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt; original</i>	<i>= original</i>	<i>&gt; original</i>
Change in the amount of cash required for this package relative to the original option package.	179	\$ 5,881.99	\$ 18,476.45	\$ -	26.3%	24.0%	49.7%

**Panel B: Univariate correlations**

<i>Independent variables</i>	<u>Pearson</u>			<u>Spearman</u>		
	<i>Change in cash</i>	<i>p-value</i>		<i>Change in cash</i>	<i>p-value</i>	
Risk preference	-0.08	0.28		<b>-0.14</b>	<b>0.07</b>	*
Wealth level	0.01	0.93		-0.09	0.41	
Wealth percent	0.08	0.48		0.07	0.53	
Option optimist	0.00	0.96		0.08	0.32	
Option ignorant	<b>-0.21</b>	<b>0.01</b>	***	<b>-0.23</b>	<b>0.00</b>	***
Granted options	0.12	0.11		0.11	0.17	
Intrinsic	-0.06	0.46		-0.09	0.23	
Gender	0.14	0.07		<b>0.14</b>	<b>0.06</b>	*
Age	-0.04	0.63		-0.02	0.81	
Current/future manager	0.04	0.63		-0.02	0.79	

**Panel C: Multiple regression**

	<u>Coefficient</u>	<u>t-statistic</u>
Constant	15,451.18	1.42
Risk preference	-1,193.17	-0.69
Wealth dummy	1,844.57	0.37
Wealth level	-388.54	-0.30
Wealth percent	90.36	0.78
Option optimist	-2,624.36	-0.56
Option ignorant	<b>-8,752.91</b>	<b>-2.58</b> ***
Granted options	4,350.89	1.34
Intrinsic	-301.90	-0.06
Gender	4,193.21	1.24
Age	-248.90	-0.90
Current/future manager	1,315.39	0.36
N	169	
Adjusted r-squared	4%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

① \$5881.99 > 0; p < 0.01

**Table 8**  
**Stock options: Change in cash required for the option package when STOCK PRICE VOLATILITY increases**

Recall that under the original stock option details Firm Z's stock price volatility was 30 percent. Now consider an ALTERNATE option package where all of the original details remain exactly the same, except that Firm Z's stock price volatility is 50 percent.

**Panel A: Questions and descriptive statistics**

<i>Question</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt; original</i>	<i>= original</i>	<i>&gt; original</i>
Change in the amount of cash required for this package relative to the original option package.	183	\$ 924.19	\$ 15,476.54	\$ -	34.4%	24.0%	41.6%

**Panel B: Univariate correlations**

<i>Independent variables</i>	<u>Pearson</u>			<u>Spearman</u>		
	<i>Change in cash</i>	<i>p-value</i>		<i>Change in cash</i>	<i>p-value</i>	
Risk preference	-0.02	0.84		0.00	0.98	
Wealth level	0.15	0.14		0.11	0.27	
Wealth percent	-0.06	0.61		-0.16	0.13	
Option optimist	-0.04	0.60		-0.02	0.78	
Option ignorant	<b>-0.13</b>	<b>0.07</b>	*	<b>-0.15</b>	<b>0.04</b>	**
Granted options	-0.02	0.77		0.03	0.70	
Intrinsic	0.03	0.70		-0.02	0.84	
Gender	0.07	0.36		0.10	0.17	
Age	0.01	0.90		-0.02	0.79	
Current/future manager	0.06	0.40		0.05	0.54	

**Panel C: Multiple regression**

	<u>Coefficient</u>	<u>t-statistic</u>
Constant	8,347.61	0.92
Risk preference	-136.59	-0.10
Wealth dummy	-3,539.72	-0.86
Wealth level	1,266.97	1.20
Wealth percent	10.65	0.11
Option optimist	-2,217.92	-0.59
Option ignorant	<b>-5,711.19</b>	<b>-2.06</b> **
Granted options	-2,339.02	-0.86
Intrinsic	2,588.22	0.69
Gender	1,166.94	0.42
Age	-148.87	-0.65
Current/future manager	2,764.39	0.90
N	172	
Adjusted r-squared	-1%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

● \$924.19 vs 0; p = 0.42

**Table 9**  
**Restricted stock: Change in cash required for the restricted stock package when STOCK PRICE VOLATILITY increases**

Recall that under the original restricted stock details Firm Z's stock price volatility was 30 percent. Now consider an ALTERNATE restricted stock package where all of the original details remain exactly the same, except that Firm Z's stock price volatility is 50 percent.

**Panel A: Questions and descriptive statistics**

<i>Question</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt; original</i>	<i>= original</i>	<i>&gt; original</i>
Change in the amount of cash required for this package relative to the original restricted stock package.	181	\$ 105.30	\$ 9,215.82	\$ -	37.6%	31.5%	30.9%

**Panel B: Univariate correlations**

<i>Independent variables</i>	<u>Pearson</u>			<u>Spearman</u>		
	<i>Change in cash</i>	<i>p-value</i>		<i>Change in cash</i>	<i>p-value</i>	
Risk preference	0.08	0.30		0.12	0.12	
Wealth level	<b>0.17</b>	<b>0.09</b>	*	0.15	0.14	
Wealth percent	-0.09	0.44		-0.16	0.14	
Restricted stock optimist	<b>0.17</b>	<b>0.02</b>	**	<b>0.15</b>	<b>0.04</b>	**
Restricted stock ignorant	0.02	0.77		0.02	0.84	
Granted restricted stock	0.05	0.48		0.02	0.83	
Gender	0.07	0.33		-0.01	0.89	
Age	0.02	0.83		-0.06	0.45	
Current/future manager	-0.01	0.88		0.03	0.68	

**Panel C: Multiple regression**

	<u>Coefficient</u>	<u>t-statistic</u>
Constant	-3,223.80	-0.72
Risk preference	651.51	0.78
Wealth dummy	-822.31	-0.34
Wealth level	912.14	1.47
Wealth percent	-32.19	-0.57
Restricted stock optimist	<b>5,480.46</b>	<b>2.93</b> ***
Restricted stock ignorant	309.57	0.15
Granted restricted stock	1,289.42	0.66
Gender	1,394.44	0.88
Age	12.81	0.09
Current/future manager	-1,389.32	-0.81
N	171	
Adjusted r-squared	2%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

● \$105.30 vs 0; p = 0.88

**Table 10**  
**Stock Options: Change in cash required for the option package when STOCK PRICE MOMENTUM is positive or negative**

SCENARIO 1: Firm Z's stock price has increased from \$24 per share to \$30 per share over the last six months (a 25 percent increase). The consensus long-term analyst forecasts for Firm Z projects a 30 percent annual increase in earnings over the next five years.

SCENARIO 2: Firm Z's stock price has decreased from \$40 per share to \$30 per share over the last six months (a 25 percent decrease). The consensus long-term analyst forecasts for Firm Z projects a 30 percent annual increase in earnings over the next five years.

We also repeated details for the original stock option package (for details see Table 3).

**Panel A: Descriptive statistics**

	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt; \$30,000</i>	<i>= \$30,000</i>	<i>&gt; \$30,000</i>
(1) The amount of cash that participants said Firm Z would have to offer them under SCENARIO 1 relative to the amount they required in the stock option base case.	179	<b>1 2</b> \$ 5,290.91	\$ 20,058.37	\$ -	19.6%	42.5%	37.9%
(2) The amount of cash that participants said Firm Z would have to offer them under SCENARIO 2 relative to the amount they required in the stock option base case.	179	<b>3</b> \$ 657.39	\$ 21,491.46	\$ -	36.9%	39.7%	23.4%

**Panel B: Univariate correlations**

<i>Independent variables</i>	<i>Up momentum</i>				<i>Down momentum</i>			
	<i>Pearson</i>		<i>Spearman</i>		<i>Pearson</i>		<i>Spearman</i>	
	<i>Change in cash</i>	<i>p-value</i>	<i>Change in cash</i>	<i>p-value</i>	<i>Change in cash</i>	<i>p-value</i>	<i>Change in cash</i>	<i>p-value</i>
Risk preference	-0.08	0.30	-0.08	0.30	-0.01	0.86	-0.07	0.38
Wealth level	0.04	0.66	0.00	0.98	0.04	0.70	0.04	0.72
Wealth percent	<b>0.19</b>	<b>0.08</b> *	0.05	0.63	0.05	0.62	-0.03	0.79
Option optimist	-0.05	0.53	-0.02	0.83	0.03	0.73	0.03	0.66
Option ignorant	<b>0.12</b>	<b>0.10</b> *	<b>0.13</b>	<b>0.08</b> *	0.04	0.64	-0.03	0.68
Granted options	-0.01	0.94	0.03	0.71	-0.09	0.26	-0.01	0.95
Intrinsic	0.05	0.54	0.05	0.48	-0.09	0.24	<b>-0.13</b>	<b>0.09</b> *
Gender	-0.07	0.40	-0.10	0.18	-0.02	0.76	0.07	0.36
Age	0.11	0.16	<b>0.17</b>	<b>0.03</b> **	0.05	0.55	0.10	0.18
Current/future manager	0.04	0.60	-0.06	0.45	<b>0.13</b>	<b>0.08</b> *	<b>0.16</b>	<b>0.04</b> **

**Panel C: Multiple regression**

	<i>Up momentum</i>		<i>Down momentum</i>	
	<i>Coefficient</i>	<i>t-statistic</i>	<i>Coefficient</i>	<i>t-statistic</i>
Constant	-977.12	-0.09	8,418.33	0.67
Risk preference	-2,504.39	-1.36	-548.12	-0.27
Wealth dummy	-3,116.56	-0.60	-4,205.19	-0.72
Wealth level	376.52	0.28	-310.86	-0.21
Wealth percent	<b>292.31</b>	<b>2.42</b> **	139.95	1.04
Option optimist	-462.60	-0.10	-3,801.62	-0.73
Option ignorant	5,276.87	1.52	3,371.99	0.87
Granted options	-4,222.82	-1.22	<b>-8,516.88</b>	<b>-2.21</b> **
Intrinsic	-3,805.51	-0.80	<b>-8,909.75</b>	<b>-1.68</b> *
Gender	-2,502.09	-0.71	-549.60	-0.14
Age	317.18	1.09	-40.64	-0.13
Current/future manager	-178.15	-0.05	<b>12,049.24</b>	<b>2.77</b> ***
N	170		170	
Adjusted r-squared	0%		3%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

- 1 \$5,290.91 > 0; p < 0.01
- 2 \$5,290.91 > \$657.39; p < 0.01
- 3 \$657.39 vs 0; p = 0.68

**Table 11**  
**Restricted stock: Change in cash required for the restricted stock package when STOCK PRICE MOMENTUM is positive or negative**

SCENARIO 1: Firm Z's stock price has increased from \$24 per share to \$30 per share over the last six months (a 25 percent increase). The consensus long-term analyst forecasts for Firm Z projects a 30 percent annual increase in earnings over the next five years.

SCENARIO 2: Firm Z's stock price has decreased from \$40 per share to \$30 per share over the last six months (a 25 percent decrease). The consensus long-term analyst forecasts for Firm Z projects a 30 percent annual increase in earnings over the next five years.

We also repeated details for the original restricted stock package (for details see Table 4).

**Panel A: Descriptive statistics**

	<i>n</i>		<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>&lt; \$30,000</i>	<i>= \$30,000</i>	<i>&gt; \$30,000</i>
(1) The amount of cash that participants said Firm Z would have to offer them under SCENARIO 1 relative to the amount they required in the restricted stock base case.	179	① ②	\$ 5,322.33	\$ 14,915.72	\$ -	16.2%	43.0%	40.8%
(2) The amount of cash that participants said Firm Z would have to offer them under SCENARIO 2 relative to the amount they required in the restricted stock base case.	174	③	\$ 816.60	\$ 8,639.34	\$ -	25.9%	42.0%	32.1%

**Panel B: Univariate correlations**

<i>Independent variables</i>	<b>Up momentum</b>					<b>Down momentum</b>					
	<b>Pearson</b>			<b>Spearman</b>		<b>Pearson</b>			<b>Spearman</b>		
	<i>Change in cash</i>	<i>p-value</i>		<i>Change in cash</i>	<i>p-value</i>	<i>Change in cash</i>	<i>p-value</i>		<i>Change in cash</i>	<i>p-value</i>	
Risk preference	0.06	0.46		0.02	0.85	0.00	0.98		0.02	0.76	
Wealth level	-0.10	0.35		<b>-0.20</b>	<b>0.05</b>	**	-0.04	0.70	-0.06	0.58	
Wealth percent	<b>0.27</b>	<b>0.01</b>	***	-0.04	0.75	0.10	0.38	-0.05	0.65		
Restricted stock optimist	0.08	0.31		-0.02	0.83	0.03	0.67	-0.05	0.52		
Restricted stock ignorant	-0.06	0.42		-0.09	0.23	-0.08	0.31	-0.10	0.20		
Granted restricted stock	-0.07	0.40		-0.05	0.50	-0.01	0.89	-0.02	0.84		
Gender	0.04	0.62		0.00	0.96	0.08	0.31	0.05	0.52		
Age	<b>-0.16</b>	<b>0.03</b>	**	-0.09	0.23	-0.01	0.95	-0.03	0.74		
Current/future manager	<b>-0.18</b>	<b>0.02</b>	**	<b>-0.19</b>	<b>0.01</b>	***	<b>0.15</b>	<b>0.05</b>	**	0.11	0.13

**Panel C: Multiple regression**

	<b>Up momentum</b>		<b>Down momentum</b>	
	<i>Coefficient</i>	<i>t-statistic</i>	<i>Coefficient</i>	<i>t-statistic</i>
Constant	<b>14,785.67</b>	<b>1.99</b> **	1,919.01	0.52
Risk preference	40.02	0.03	236.39	0.34
Wealth dummy	-3,510.47	-0.88	-197.36	-0.10
Wealth level	69.72	0.07	-516.97	-1.01
Wealth percent	<b>227.75</b>	<b>2.46</b> **	49.31	1.07
Restricted stock optimist	2,497.91	0.79	-1,553.87	-1.00
Restricted stock ignorant	-4,738.71	-1.34	-2,023.40	-1.16
Granted restricted stock	-2,701.05	-0.83	-524.35	-0.33
Gender	3,128.01	1.16	1,104.16	0.82
Age	-275.18	-1.22	-64.98	-0.58
Current/future manager	-4,639.60	-1.62	<b>2,820.64</b>	<b>1.99</b> **
N	170		166	
Adjusted r-squared	4%		-1%	

NOTES: Significant at \*10%, \*\*5%, \*\*\*1%

- ① \$5,322.33 > 0; p < 0.01
- ② \$5,322.33 > \$816.60; p < 0.01
- ③ \$816.60 vs 0; p = 0.21