

Loss Aversion, Stock-Based Compensation and Managerial Risk-Seeking Behavior

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Abstract

Traditional agency theorists generally predict that stock options induce managerial risk-seeking behavior and restricted stock induces risk-averse behavior because of the respective payoff functions. Behavioral theories, however, relax the consistent risk aversion assumption underlying traditional agency theory and predict that the decision context (gain or loss) and the level of risk-bearing are predictive of risk-seeking behavior. In an experiment involving 292 MBA students who are asked to choose between a riskless and a risky investment project, we manipulate the decision context (gain or loss) and the type of stock-based compensation (at-the-money stock options with a recontracting provision, at-the-money stock options, in-the-money stock options or restricted stock). Consistent with the behavioral theories, we find that more participants choose the risky project in the loss context while more participants choose the riskless project in the gain context. In addition, we find fewer participants in the loss context choose the risky project when they have in-the-money stock options (more risk-bearing) than participants with at-the-money stock options with a recontracting provision (less risk-bearing). Contrary to traditional agency model predictions, we do not find that participants that were assigned stock options choose risky projects more frequently than participants with restricted stock. Rather, we find that in the loss context, participants endowed with restricted stock choose risky projects more frequently than participants with stock options. These results are consistent with the view that managers subjectively overvalue stock options relative to restricted stock. Our findings are important for those using and evaluating the efficacy of stock-based compensation in inducing value-increasing risk-seeking behavior. Particularly in the loss context, we find evidence consistent with managerial risk-seeking behavior being driven by the subjective rather than the objective valuation of these different types of stock-based compensation.

1. Introduction

Stock-based compensation is often used to provide incentives for risk-averse managers to invest in risky, positive net present value projects that increase firm value and thereby align managers' goals with those of owners.¹ However, depending on the decision context and the manager's perception of the stock-based compensation, different managerial risk-seeking and hence different firm value effects may arise. For example, excessive risk-seeking allegedly attributable to the rise in stock option grants has been linked to the demise of Enron, WorldCom and other companies (e.g., Hall and Murphy 2003). Recently, many firms have shifted from stock options to restricted stock grants despite concerns about the efficacy of restricted stock in providing firm-value increasing incentives to managers (Frieswich 2003).² Ultimately, the impact of different types of stock-based compensation on managerial risk-seeking behavior is an open empirical question (Core et al. 2003). As a result, we examine how loss aversion and risk-bearing in stock-based compensation together impact managerial risk-seeking behavior.

Traditional agency theorists generally predict that while stock options encourage managerial risk seeking behavior because of its convex payoff function, restricted stocks discourage managerial risk-seeking behavior because of its linear payoff function (see Appendix A for a numerical example and Figure 1 for a graphic depiction). However, recent empirical evidence suggests that holders do not necessarily utilize these objective option valuation models in their decision-making. For example, Heath et al. (1999) find that holders exercise their options in response to recent stock price trends as consistent with psychological models of option value

¹ Stock-based compensation emerged as the largest component of compensation in the 1990s (Hall and Liebman, 1998; Murphy, 1999)

² For example, Mercer Consulting's Future of Equity SnapShot indicates that 63% of surveyed firms reduced the number of stock options granted or to be granted and adopted new restricted stock plans (Oren, Doubleday and Katz, 2003). The Los Angeles Times reports that Microsoft, the Altria Group, Dell Computer Corp., Cendant Corp. and DaimlerChrysler AG are issuing restricted stocks instead of stock options (Reh, 2004).

rather than in reference to the predetermined strike price as predicted in rational financial theories. In addition, research on managerial risk-seeking behavior suggests that the managers' project choice does not depend on relative expected value but rather depends on whether the competing projects are in a gain or loss context (Smith and Kida 1995). In this case, prospect theory predicts that decision makers will be less risk-seeking when deciding between projects involving potential gains and more risk-seeking when deciding between projects involving potential losses (i.e., loss aversion). Considering other decision-relevant characteristics, Moreno et al. (2002) find that affective reactions reverse prospect theory predictions for managerial risk-based choices. Taken together, these studies suggest that besides project financial information, contextual variables and managers' perceptions together impact managerial choices.

In this study, we draw from Wiseman and Gomez-Mejia's (1998) behavioral agency model and argue that the decision context and relative subjective valuations of stock options and restricted stock together impact managerial risk-seeking behavior. Assuming managers are loss-averse rather than consistently risk-averse, managers would rather avoid losing wealth than take risks to gain wealth (Tversky and Kahneman 1986, 1991). This means that managers will be more risk-seeking in the loss context and less risk-seeking in a gain context. It follows then that the more wealth managers have at stake, the less risk-seeking they behave within those decision contexts (Wiseman and Gomez-Mejia 1998). Said another way, the greater the perceived risk to managers' wealth (i.e., greater risk-bearing), the less risk-seeking managers will behave. Further, we argue that how managers subjectively value different types of stock-based compensation affect the relative efficacy of these different types of stock-based compensation in providing firm-value increasing incentives. For example, if managers undervalue stock options relative to the objective valuation because managers are less diversified than owners and options are not

tradable (e.g., Hall and Murphy 2002; Lambert et al. 1991; Meulbroek 2001), then managers will have lower risk-bearing and hence exhibit more risk-seeking behavior. However, if managers overvalue stock options relative to the objective valuation because they extrapolate recently rising stock price trends into their subjective valuations (Heath et al. 1999) and endow such value in their current wealth at stake (Devers et al. 2007), then managers will have greater risk-bearing and hence exhibit less risk-seeking behavior. Moreover, if stock options are overvalued relative to restricted stock (Hodge et al. 2005), then managers will be less-risk seeking when endowed with stock options and more risk-seeking when endowed with restricted stock.

To examine whether loss aversion and risk-bearing together impact managerial risk-seeking behavior, we ask 292 MBAs to choose between a riskless project and a risky investment project in a 2 x 4 between-subjects experiment. We vary the decision context (gain or loss) and the type of stock-based compensation (at-the-money with a recontracting provision, at-the-money stock options, in-the-money stock options and restricted stock) and explicitly provide participants with the objective value for their compensation type. If participants were to make a choice based solely on higher expected values, then the rational choice in the gain (loss) context would be the risky project (riskless project). Because in the gain condition we already predict less risk-seeking behavior due to loss aversion, we use the at-the-money stock options with a recontracting provision (in the form of cash payouts, repricings or additional stock option grants in the event that existing options become underwater) and the at-the-money stock option conditions as benchmarks to gauge whether greater risk-bearing (i.e., in-the-money stock options) further lessens risk-seeking behavior. In contrast, because in the loss condition we predict more risk-seeking behavior due to loss aversion, we use the at-the-money stock options with a recontracting provision and the at-the-money stock option conditions as benchmarks to

gauge whether greater risk-bearing (i.e., in-the-money stock options) mitigate the loss aversion effect. Further, to test for relative risk-bearing effects between stock options and restricted stock, we compare the in-the-money stock option condition with the restricted stock condition within the gain and loss contexts.

Contrary to traditional agency model predictions, we do not find that participants endowed with stock options choose risky projects more frequently than participants endowed with restricted stock. Consistent with behavioral agency model predictions, we find that more participants choose the riskless project with a lower expected value in the gain context and more choose the risky project with a lower expected value in the loss context, thereby providing support for the loss aversion explanation. In addition, we find some evidence that risk-bearing mitigates the loss aversion effects in the loss context since participants endowed with at-the-money stock options choose risky projects with less expected value more frequently than participants endowed with in-the-money stock options with recontracting. We do not find that among the three stock option conditions in the gain context, greater risk-bearing further lessens risk-seeking behavior. Finally, we find evidence consistent with the relative risk-bearing explanation in the loss context but not in the gain context with regard to stock options compare to restricted stock. Specifically, participants endowed with in-the-money stock options choose risky projects with less expected value less frequently than participants endowed with restricted stock.

Our study contributes to the extant stock-based compensation and managerial decision-making research. First and contrary to traditional agency model predictions, our evidence indicate that managers do not necessarily utilize objective option valuation models in their decision-making and instead use subjective valuation models to inform their choices, specifically

when choosing among projects with varying risks. This responds to the call by Core et al. (2003) for research investigating the efficacy of different types of stock-based compensation. Second and consistent with behavioral agency model predictions, we find some evidence consistent with risk-bearing mitigating the loss aversion effect in that increasing wealth at stake in stock options lessens risk-seeking behavior in the loss context. Thus, we identify risk-bearing as another factor that fine-tunes our understanding of managers' decision-making process and thereby complement studies examining other risk-seeking-relevant factors (e.g., Moreno et al. 2002). Specifically, when choosing among potential loss projects such as cost-minimizing initiatives in a periods of economic downturns, increasing wealth at stake from at-the-money to in-the-money stock options results in more firm-value increasing project choices. This provides a possible explanation for prior empirical findings that firms shield managers from losses (Gaver and Gaver 1998; Cheng 2003) and firms engage in stock option recontracting (Saly 1994; Acharya et al. 2000; Ju et al. 2002). Third and in contrast to conventional economic wisdom that holders assign a discount to stock options (e.g., Hall and Murphy 2003), our results are consistent with the view that holders subjectively overvalue stock options. Specifically, we find some evidence consistent with holders subjectively overvalue stock options relative to the objective value (Devers et al. 2007) and relative to restricted stock (Hodge et al. 2005). This answers Devers et al.'s (2007) plea for research examining the influence of subjective valuation of stock options on managers' risk behavior. A key implication here is that when choosing among potential loss projects, granting restricted stock in lieu of stock options using an exchange scheme based on objective rather than subjective valuations may unintentionally discourage rather than encourage firm value-increasing managerial risk-seeking behavior.

Our research also has important practical implications. First, those designing incentive compensation systems need to consider how the decision context and the subjective valuation of different types of stock-based compensation impact managerial risk-seeking behavior. The recent switch by many firms from stock options to restricted stock (Hall 2003) to attract and retain employees and to respond to stock option expensing (Carter et al. 2006) may also result in improper exchange rates between the two and unexpected changes in managerial risk-seeking behavior, especially if the expectations are based on objective rather than subjective valuation models (Devers et al. 2007). Second, financial statement users incorporating only the reported objective and not the subjective valuation of stock-based compensation in their firm valuation assessments may result in incorrect assessments and consequently, in incorrect resource allocation decisions. Third, recent SEC regulations requiring more extensive disclosure of the types *and* rationale for stock-based compensation may find it difficult to explain the link between pay and performance without considering managers' subjective valuations.

The remainder of this paper is organized as follows. We discuss the traditional agency theory and prior research, present the behavioral agency model and develop the hypotheses in Section 2. The research method is presented in Section 3 and the results are explained in Section 4. Concluding remarks are provided in Section 5.

2. Background and Hypotheses

In decisions involving uncertainty or risk, managers are expected to estimate the expected values of competing investment projects by considering the future cash flows and the probabilities associated with those cash flows. One project may yield more certain cash flows but a lower expected value while another project may yield less certain cash flows but a higher expected value. Rationally, managers are expected to choose the more risky project with the

higher expected value. However, in the presence of agency costs, managers may not necessarily choose the firm-value increasing risky project. Stock-based compensation is often used to help align risk-averse managers' goals with those of owners.

2.1 Traditional Agency Theory and Prior Research

Agency theorists generally believe that managerial risk aversion reduces the manager's incentives to invest in risky, positive net present value projects that increase shareholder wealth (e.g., Jensen and Meckling 1976; Milgrom and Roberts 1992; Parrino et al. 2002). Stock options are generally considered to be an effective device for inducing risk-seeking behavior because of their convex payoff function (e.g. Jensen and Meckling 1976; Smith and Stulz 1985; Lambert 1986; Hemmer, Kim and Verrecchia 1999). An implicit assumption is that stock options offer asymmetric risk because managers choose whether or not to exercise stock options so that there is downside loss protection and there is significant upside gain potential (Sanders 2001). Thus, managers with stock options are predicted to choose firm-value increasing risky projects.

In contrast, traditional agency models posit that restricted stock is considered to be an ineffective device for inducing risk-seeking behavior because of its linear payoff function (Bryan, Hwang and Lilien 2000). The payoff function of restricted stock relates to its value, which is equivalent to the underlying stock price. This means that the manager directly bears the potential wealth loss from risky, positive net present value projects. Unless paid for this added risk, there is an underinvestment problem that reduces the incentives provided for managers with restricted stock. Refer to Appendix A and Figure 1 for an example of the values and payoff functions for stock options and restricted stock.

Extant empirical research on the risk incentive effects of stock options and restricted stock are hampered by model specification or data limitations. Bryan et al. (2000) empirically

find that restricted stock exhibits significantly lower incentive-intensity (i.e., the change in the value of the pay per change in the market value of equity) than stock options, and that the use of restricted stock is negatively associated with the abundance of investment opportunities. However, the inference that stock options are more effective risk incentive devices than restricted stock does not consider the endogenous nature of compensation contracts and investment decisions (Larcker 1983; Holthausen et al. 1995; Rajgopal and Shevlin 2002). Oyer and Shaefer (2003) calibrate middle managers' pay and report that the economic profits of sample firms are higher given the observed stock option grants than what the profits would have been under equivalently costly cash pay or restricted stock grants. While the authors consider that more risk-tolerant managers self-select into more risky firms, they do not specifically address how compensation is linked to managers' project choices. Sanders (2001) finds a positive (negative) association between the frequency of acquisition and divestiture activity and the level of CEO stock option pay (stock ownership). The author offers this as evidence consistent with stock options (restricted stock) leading to more (less) risk-seeking behavior. However, Sanders separates the value of restricted stock from stock ownership and measures the value of stock options granted during a given year rather than the value of the CEO's option portfolio, despite option portfolio value being important when examining the incentive effects of stock options (Core et al. 2003).

More recent theoretical studies provide mixed evidence when the stable risk preferences are relaxed and when the managers' wealth portfolio are considered. Generally, theorists find that restricted stock is more efficient than stock options in inducing managerial risk-seeking behavior when managers are risk-averse and undiversified (Hall and Murphy 2002; Henderson 2002; Jenter 2001; Meulbroek 2001; Tian 2001). Feltham and Wu (2001) find this to be the case

if the manager's efforts affect just the mean but not the variance of the stock price distribution. In contrast, stock options are found to be more efficient when a manager can diversify her private portfolio (Arnold 2003) and when the contract and manager's choice are endogenous (Lambert and Larcker 2004). Barron and Waddell (2003) consider a risk-neutral manager and find that stock options and restricted both have a role in an optimal compensation mix for a manager deciding whether to adopt or reject a plan of uncertain value.

2.2 *Behavioral Agency Model*

The behavioral agency model, developed by Wiseman and Gomez-Mejia (1998), relaxes the stable risk preference assumption underlying traditional agency models. The behavioral agency model predicts that loss aversion, risk-bearing and monitoring intensity impact managerial risk-seeking behavior. This study focuses on the first two elements.³

The element of loss aversion, which draws from prospect theory, posits problem framing effects such that managers are more risk-seeking in the domain of losses and less risk-seeking in the domain of gains. This is reflected in an S-shaped function where the slope is steeper below the reference point (loss) than it is above the reference point (gain). In other words, loss averse managers are more sensitive to losing wealth than gaining wealth (Tversky and Kahneman 1986, 1991). As a result, risk preferences of managers (and thus risk-seeking behavior) will change with the decision context (Kahneman and Tversky 1979). A gain context includes choices of varying risk and return that result in positive expected values while a loss context includes choices of varying risk and return that result in negative expected values. An example of the latter would be when a company is considering alternative ways to meet pollution control

³ With monitoring intensity, Wiseman and Gomez-Mejia (1998) propose that strong supervision (which leads to greater perceived difficulty in achieving targets), supervision focused on ex-post outcome evaluations (rather than ex-ante performance expectations), and market-based (rather than accounting-based) performance criteria all change the manager's framing of problems (i.e., increases the domain of losses) and increase managerial risk-bearing, which in turn induces less risk-seeking behavior.

requirements or must make an initial investment for strategic reasons to enter a market (e.g., a “loss leader”).

The concept of risk bearing, which draws from the idea of instant endowment, posits that managers perceive stock-based compensation as part of current wealth at stake and this increases risk-bearing (because there is something to lose).⁴ An example of instant endowment or perceived wealth at stake in stock-based compensation is the observed use of unexercised stock options as collateral to secure loans (Scannell 2001). The behavioral agency model predicts that the more wealth managers have at stake, the less risk-seeking they behave. Said another way, the greater the perceived risk to managers’ wealth (i.e., greater risk-bearing), the less risk-seeking managers will behave. Risk-bearing effects may either exacerbate or mitigate the loss aversion effects in the gain versus loss contexts. On one hand, if the gain context already induces less risk-seeking behavior, then greater risk-bearing in stock options (i.e., holding in-the-money options rather than at-the-money options) may not further decrease risk-seeking behavior. On the other hand, if the loss context induces more risk-seeking behavior, then greater risk-bearing in stock options may overshadow the loss aversion effect and instead induce less risk-seeking behavior.

Finally, we extend the idea of risk-bearing and consider relative risk-bearing effects of different types of stock-based compensation. We argue that how managers subjectively value different types of stock-based compensation affect the relative efficacy of these different types of stock-based compensation in providing firm-value increasing risk-seeking incentives. For example, if managers undervalue stock options relative to the objective valuation because

⁴ Thaler (1980) suggests that managers perceive future base salary (i.e., nonvariable) much like a renewable annuity and immediately include such into calculations of current personal wealth. Similarly, a manager’s reference point for gauging current wealth at stake depends largely on whether she anticipates returns from variable compensation (e.g., stock-based compensation). Thus, the behavioral agency model suggests that like future base salary, stock-based compensation is perceived as current wealth at stake.

managers are less diversified than owners and options are not tradable (e.g., Hall and Murphy 2002; Lambert et al. 1991; Meulbroek 2001), then managers will have lower risk-bearing and hence exhibit more risk-seeking behavior. However, if managers overvalue stock options relative to the objective valuation because they extrapolate recently rising stock price trends into their subjective valuations (Heath et al. 1999) and endow such value in their current wealth at stake (Devers et al. 2007), then managers will have greater risk-bearing and hence exhibit less risk-seeking behavior. Moreover, if stock options are overvalued relative to restricted stock (Hodge et al. 2005), then managers will be less-risk seeking when endowed with stock options and more risk-seeking when endowed with restricted stock.

2.3 Hypotheses

As discussed previously, the traditional agency model and the behavioral agency model predict different risk-seeking behavior. Both consider the manager's risk-bearing, or the risk preference induced by the type of stock-based compensation, either stock options or restricted stock. Traditional agency models assume that the convex payoff function for stock options protects the manager from potential losses on the downside and, as a result, will exhibit more risk-seeking behavior. In contrast, the linear payoff function for restricted stock exposes the manager to potential losses on the downside, as a result, the manager will exhibit risk-averse behavior. Therefore, our traditional agency model hypothesis is as follows:

H1: More managers with stock options will exhibit risk-seeking behavior compared to managers with restricted stock.

While the first hypotheses reflects the predictions of the traditional agency model, the behavioral agency model argues that other factors may influence risk-seeking behavior and that the type of stock-based compensation alone is not predictive of risk-seeking behavior. As a result, we do not anticipate that the first hypotheses will hold. Rather, we examine the behavioral

agency model which relaxes the stable risk-preference assumption and considers the impact of loss aversion and risk-bearing on managerial risk-seeking behavior. Loss averse managers follow an S-shaped value function and as a result, will be less risk-seeking in a gain context and more risk-seeking in a loss context. Thus, we predict that more managers will be risk-seeking in a loss context compared to managers in a gain context:

H2: More managers in a loss context will exhibit risk-seeking behavior compared to managers in a gain context.

Risk-bearing in stock-based compensation arises because managers instantly endow stock-based compensation as current wealth at stake. The behavioral agency model predicts that greater risk-bearing (i.e., moving from at-the-money options to in-the-money options) induces less risk-seeking behavior. Coupled with the loss aversion effects, we expect greater risk-bearing in stock options to result in less risk-seeking behavior in the gain context, but overshadow the loss aversion effects and result in less risk-seeking behavior in the loss context. Thus, we predict:⁵

H3: More managers with at-the-money options will exhibit risk-seeking behavior compared to managers with in-the-money options.

Finally, relative risk-bearing in stock-based compensation considers managers' subjective valuation of different types of stock-based compensation. If managers undervalue stock options relative to the objective valuation, then managers will have lower risk-bearing and hence exhibit more risk-seeking behavior. However, if managers overvalue stock options relative to the objective valuation, then managers will have greater risk-bearing and hence exhibit less risk-seeking behavior. Moreover, if stock options are overvalued relative to restricted stock, then managers will be less-risk seeking when endowed with stock options and more risk-seeking

⁵ Note that in H3 we do not rank order all three types of stock option conditions along with restricted stock. This is because there are two competing views on how stock options are subjectively valued relative to restricted stock. We address this question in H4.

when endowed with restricted stock. Taking the view that stock options are overvalued relative to restricted stock, we predict:

H4: More managers endowed with restricted stock will exhibit risk-seeking behavior compared to managers endowed with stock options.

3.0 Method

3.1 Experimental Design

Table 1 provides an overview of the experiment and the hypotheses tests, which entails a 2 x 4 between-subjects design where one independent variable is the decision context (gain or loss) and the other independent variable is the type of stock-based compensation (at-the-money stock options with a recontracting provision, at-the-money stock options, in-the-money stock options or restricted stock). The experimental materials describe the type of stock-based compensation in effect in addition to a base salary and that the stock-based compensation is fully vested and that the stock options are about to expire.⁶ The materials also explicitly describe the objective valuation of the compensation type in the participant's experimental condition.⁷ For example, under the at-the-money stock option conditions in the gain and loss contexts, the current stock price of \$10 is equal to the exercise price and hence the objective valuation is zero [(\$10-10) x 100,000 stock options]. For the in-the-money stock option conditions and restricted stock conditions in the gain and loss contexts, the current stock price is \$11 so that the objective valuation is \$100,000 [(\$11-10) x 100,000 stock options] and \$110,000 [(\$11 x 100,000 units of restricted stock)], respectively.

⁶ Setting the stock-based compensation as vested and close to expiration increases the likelihood that the perceived wealth at stake associated with it will be based on what managers consider a 'tangible' (or controllable) value rather than a 'theoretical' value. This also ensures that the participants will use the modified intrinsic method to value stock option compensation, in particular, as equivalent to the expected future stock price less the exercise price (Hodge, Rajgopal and Shevlin 2005).

⁷ The current wealth at stake only relates to the assigned stock-based compensation. Hence, we do not explicitly control for the manager's ability to hedge firm-specific risk. Rather, we explore whether hedging is a possible explanation for risk-seeking behavior through the content analysis discussed in a later section.

We set the initial wealth differently between at-the-money stock options and in-the-money stock options in order to test the effect of increasing risk-bearing on managerial risk-seeking behavior (H3). We purposefully set the objective valuation of the in-the-money stock options to be at the same level but slightly lower than that of the restricted stock conditions to test the effect of relative risk bearing on managerial risk-seeking behavior (H4). If managers use objective valuation as a factor in their managerial risk-seeking behavior then this design choice biases against us finding support for the view that managers overvalue stock options relative to the objective valuation and relative to restricted stock. Finally, this design choice is similar to that made by Tversky and Kahneman (1986, S259) where they find that “the effective carriers of values are gains and losses, or changes in wealth, rather than states of wealth as implied by the rational model.” Thus we design the experiment so that the change in wealth is the same in all gain conditions and the same in all loss conditions. The change in wealth is discussed further in the next subsection.

3.1 The Task

Our experiment provides each participant with a choice between a riskless project and a risky project that are the same in all other dimensions except for the amounts and probabilities associated with each. In the gain context, the choice is between a sure net gain of \$2,400,000 and an expected net gain of \$2,500,000 (25% chance of a \$10,000,000 net gain and 75% chance of zero net gain), while in the loss context, the choice is between a sure net loss of \$7,400,000 and an expected net loss of \$7,500,000 (75% chance of a \$10,000,000 net loss and 25% chance of zero net loss). The amounts and probabilities are adapted from classic framing problems wherein the S-shaped value function is characterized by nonlinearities in the decision weights and

subjective values (Tversky and Kahneman 1981).⁸ In the gain contexts, the net gain in wealth is \$24,000 for both the stock option and restricted stock conditions. The net loss in wealth is \$75,000 in the restricted stock condition and zero in the stock option conditions since in the latter case, the resulting stock price is above the exercise price so the stock options are unlikely to be exercised at the time and thus there would be no net loss in wealth.⁹

If managers were to make decisions solely based on expected value results, the rational choices would be to take the risky choice in the gain context (i.e., Project B) and the sure net loss in the loss context (i.e., Project A). In contrast, the concept of loss aversion in the behavioral agency model is expected to result in the relative attractiveness of the sure net gain over the risky choice in the gain context (i.e., Project A), and the relative attractiveness of the risky choice over the sure net loss in the loss context (i.e., Project B). Therefore, our design provides a strong test for the behavioral agency model predictions in potentially biasing against the investment choices predicted by this model.

To avoid potential biases due to perceived industry effects (e.g., high tech firms) or firm characteristics (e.g., size), the case describes a generic “multi-product company” (ZIAM Inc.) that has grown through strategic alliances and integration with suppliers and distribution channels. The firm is further described as one with a reputation for strong financial performance. No specific industry is mentioned.

⁸ In the expected utility model, the utility of an uncertain outcome is weighted by its probability. In prospect theory, the value of an uncertain outcome is multiplied by a decision weight which is a monotonic function of the probability, but is not the probability. This nonlinear decision weighting function is such that low probabilities are overweighted, moderate to high probabilities are underweighted, and the latter is more pronounced than the former. Hence, the 25% stated probability is subjectively overweighted and the 75% stated probability is subjectively underweighted (Tversky and Kahneman 1981).

⁹ The loss condition is framed as “critically important to your company’s overall strategy plan”. Although in practice it is possible that such an investment may be viewed by the market as valuable and result in a stock price increase, in the experiment we indicate the investment will result in a decrease in stock price. This is necessary to invoke the personal loss frame for participants to test our hypotheses. Participants appeared to readily accept our loss manipulations, i.e., in open-ended responses none of them questioned the ecological validity of the investment resulting in a stock price decline.

It is important to establish a link between the manager's choice and the ultimate impact on her stock-based compensation. The underlying model then is:

Manager's choice → *Firm profitability* → *Stock Price* → *Manager's stock-based compensation*.

This link is made salient in the experiment by indicating that the investment choices are material and directly impact the firm's income and earnings per share (EPS), which has been strongly tied in the past to stock price. See Table 1 for a summary of the project choice set, net gain or net loss effect, resulting EPS and stock price, initial wealth and projected wealth outcome information provided to each participant in each experimental condition. To determine whether this link is properly encoded by participants a question posed at the end of the experiment asked their assessment (on a scale of 0 indicating no effect, 50 a direct but limited effect, and 100 indicating a direct and significant effect) of how strongly they believe the outcome of their investment choice will affect the firm's stock price. Over 83% of the participants expressed a strong belief (median of 70 out of 100) that the outcome of their project choice has a direct but limited impact on the firm's stock price, suggesting they saw the effect intended. As discussed later, the response on this scale is also used as a covariate in additional logit analyses.

3.2 *Participants*

Participants are MBA students, since many of them have work experience and educational, professional and financial interests in becoming a manager who will likely receive stock-based compensation. Further, the task, as described previously, is a straight-forward choice of two options and does not require intricate, in-depth knowledge of capital budgeting choices. All the information about the decision parameters is provided, i.e., the potential outcomes and

the likelihood of each outcome. Therefore, limited task knowledge is required, and MBAs are likely to be familiar with investment choice decisions through their studies and work experience. Therefore, they are considered good surrogates for managers in the task considered.

Table 2 provides demographic data on the participants, which indicates that they have an average work experience of 6.13 years. Further, 45% have had some actual working experience making capital investment decisions. In addition, untabulated results indicate that 87% (77%) have enrolled in one or more accounting (finance) courses, and 79% have exposure in prior classes with the topic of investment choice decisions (the focus of the case).¹⁰ Of some concern, only 27% (7%) have actually received some form of stock options (restricted stock). However, as will be discussed later, experience with these forms of stock-based compensation was not found to be a significant covariate in any of the analyses. Chi-square and t-tests reveal no significant differences in demographic characteristics between the experimental conditions.

Participants were randomly assigned to the experimental conditions. Out of a total of 302 participants, 292 completed all of the necessary parts of the task. As shown in Table 2 the cell sizes range from 25-27 for at-the-money stock options with a recontracting provision, 40-43 for at-the-money stock options, 24-27 for in-the-money and 52 for restricted stock conditions. Two pilot tests were conducted prior to the final experiment with 28 and 15 MBA participants. The pilot tests led to clearer identification and description of the various stock-based compensation settings, since there appeared to be some confusion as to the type and nature of compensation received. Further, manipulation check questions were revised as well as additional ones added to

¹⁰ Elliott, Hodge Kennedy and Pronk (2004) found that early MBA students act as good proxies for investors when they have the ability, knowledge and experience in the specific investment task. They found that when early MBA students had general work experience greater than 5 years or had course work related to evaluation of firm performance, the early MBAs made decisions similar to investors. In our study we are using MBAs as proxies for managers and argue that they are good proxies for managers making capital investment decisions because, similar to the Elliott et. al (2004) students, they have the ability, knowledge (number of accounting and finance classes and amount of exposure to the topic of investment choice decisions) and experience (real work experience with making capital investment decisions and general work experience).

determine whether the participant knew the type of stock-based compensation applied to his/her situation as well as how the various types differ. Other minor wording changes were made in the instrument and questions.

3.3 Administration

The experiment was administered under controlled class conditions by one of the researchers. Introductory remarks and an informed consent form revealed participation was strictly voluntary. To motivate participants to maximize their compensation, as described in the experiment, they were informed that they would receive a cash payment based on the outcome of their project choice, with a minimum payment of \$6 and a maximum of \$25.¹¹ The minimum payment was intended to adequately compensate participants for their time, while the maximum amount was established at a level that was sufficiently high based on pilot tests to motivate participants to pay close attention and exert effort.¹² If the participant chose Project A (the riskless choice), then the payment was a set amount (\$8). If the participant chose Project B which has more than one potential outcome, then a random number generator determined the outcome based on the relative probabilities of each potential outcome. The payment was then based on that outcome. For example, if a participant was assigned to the stock option and gain context and she chooses project A (the sure bet), the payment was \$8. If the participant chooses Project B (the risky bet), the random number determined the payment. If the random number is greater

¹¹ Evans, Hannan, Krishnan, and Moser (2001) examined managerial honesty using three experiments with three different levels of payoff (\$0 to \$33.33, \$0 to 66.67, \$0 to \$333.33). They found that the level of payoff did not influence the level of truthful reporting, i.e, \$333.33 was not a more of an incentive to lie than \$33. As a result, the level of payoff in this study (\$6 to \$25) is considered to be a sufficient incentive in our context.

¹² In one administration of the experiment, compensation ranged from \$8 to \$50. If a participant chose Project A (the riskless choice), then the payment was a set amount (\$12). If the participant chose Project B (the risky choice), a random number generator determined the payout amount. If the random number is greater than 0.25, the payment was \$8, and \$50 otherwise. There were no differences in project choice between the group who received an average of \$12 and the rest of the participants that received an average of \$8.

than 0.25, the payment was \$6, and \$25 otherwise, consistent with the probabilities given in the instrument.

The experimental task took about 15-20 minutes to complete. In order to pay participants, we needed to know who completed each instrument. However, we also wanted to preserve anonymity. To accomplish this, participants signed their name on a small card, which was placed in a large envelope with the experimental materials but separated from the completed instrument. When payment was made to the participant, the card was handed back to him or her thereby eliminating any opportunity of subsequently linking responses to the name of the participant. See Appendix B for an example of the at-the-money stock option/gain context experimental condition and Appendix D for an example of the restricted stock/loss context experimental condition.

4.0 Results

4.1 *Manipulation Checks and Knowledge Questions*

The experimental materials were separated into two parts: the case; and the manipulation check and knowledge questions. Participants were told to complete part I first (the case) and then put it in a large envelope prior to responding to part II. This action made it very difficult for the participant to go back and refer to the case when completing the manipulations check and knowledge questions.

The two manipulation check questions are provided in Appendix C and the results are reported in Table 3, Panel A. These findings provide support that the manipulations were successful with respect to the gain or loss context (88% correct) and the type of stock-based compensation assigned (73% correct). Two multiple choice questions sought to determine participants' understanding of the nature of the various stock-based compensation schemes.

Table 3, Panel B reports the participant's knowledge about the experimental condition under which they were assigned. Participants had the highest knowledge scores for the multiple choice question that pertains to their assigned stock-based compensation (95% for stock options at-the-money, 73% for restricted stock and 91% for stock options at the money with recontracting).¹³ In all, responses indicated participants generally understood the type of stock-based compensation to which they were randomly assigned.

4.2 *Hypotheses tests*

As discussed previously, participants were asked to choose between two investment projects, one that provides a certain outcome (the riskless choice) and the other that provides an uncertain outcome (the risky choice). Traditional agency models generally predict that more participants with stock options will exhibit risk-seeking behavior (choose project B) compared to participants with restricted stock (H1). However, the behavioral agency model suggests that risk-bearing and loss aversion may influence risk-seeking behavior and, as a result, the type of stock-based compensation alone (stock options versus restricted stock) may not predict risk-seeking behavior. As a result, we do not believe that the traditional agency predictions will hold. Table 4 presents the percentage of participants with stock options and restricted stock who chose project B (risky choice) overall as well as by gain/loss context. Forty-five percent of the participants with stock options chose project B compared to 52% of the participants with restricted stock, indicating that stock options induce less risk-seeking behavior than restricted stock, which is in the opposite direction of that predicted by the traditional agency model.¹⁴ Based on a Chi-square

¹³ Hypotheses tests that excluded participants with incorrect answers to the knowledge questions pertaining to their experimental condition were qualitatively similar to the results that included all participants. All participants are included in the analyses presented.

¹⁴ These results are similar if the individual stock option conditions are compared to the restricted stock condition. For example, 48% of participants choose project B in the at-the-money with recontracting condition, 43% in the at-the-money condition and 45% in the in-the money condition. In addition, the distribution of choice was not statistically different between any of the individual stock option conditions and restricted stock.

test, however, the distribution of choice between participants with stock options and those with restricted stock is not significantly different ($p = 0.16$).¹⁵ These results indicate that the traditional agency model predictions are not supported i.e., the type of stock-based compensation alone may not predict risk-seeking behavior.

The behavioral agency model predictions on the other hand predict that loss aversion and risk-bearing may impact risk-seeking behavior. First, the behavioral agency model predictions focus on risk preference induced by the type of decision context. We predict that more managers in the loss context will exhibit risk-seeking behavior compared managers in the gain context (H2). Table 4 presents the percentage of participants who chose project B (risky choice). Fifty-six percent of the participants in the loss context chose project B while only 40% do so in the gain context, indicating that more participants in the loss context exhibit risk-seeking behavior than participants in the gain context (Chi-squared test; $p < 0.01$).¹⁶ These results provide support for the first behavioral agency model prediction (H2).

The second behavioral agency prediction is that risk-bearing will influence risk-seeking behavior. We predict that more managers with at-the-money stock options with a recontracting provision will exhibit risk-seeking behavior compared to managers with in-the-money stock options (H3). Using the objective valuation of the initial wealth of the stock-based compensation, at-the-money stock options is zero but has a recontracting provision which

¹⁵ In addition to Chi-square tests comparing the choice distribution between conditions, we performed logit regressions to test each hypothesis including the following covariates: prior capital investment experience, exposure to stock-based compensation plans, age, gender and participant's belief regarding the affect of their investment choice on the stock price. Untabulated results indicate that work experience, capital investment experience, exposure to stock compensation, gender and age are highly and significantly correlated with each other. The results for the logit regressions were qualitatively similar to the chi-squared tests and non of the covariates or interactions were significant.

¹⁶ Similar results were found when the individual stock compensation types were tested. Participants in the loss condition chose the risky choice more than participants in the gain condition with had at-the-money with recontracting ($p = 0.029$), at-the-money ($p = 0.081$) and restricted stock ($p = 0.038$). Forty-eight percent of the participants with in-the-money stock options chose project B in the gain condition and only 42% chose project B in the loss condition, contrary to H2.

protects the manager from potential perceived loss. The initial wealth for at-the-money stock options also has an objective valuation of zero but has no explicit ex-ante protection from potential perceived loss, while the objective valuation of in-the-money stock options is \$110,000. Based on these objective values, we would expect that at-the-money stock options with a recontracting provision have the least risk-bearing, followed by at-the-money stock options and then in-the-money stock options. Hence, we would expect fewer managers to exhibit risk-seeking behavior as the wealth at stake increases. Table 5 presents the percentage of participants who chose project B (risky choice) in each of the stock option conditions. In the loss condition, participants in the at-the-money stock options with a recontracting provision were more risk seeking (64%), followed by participants in the at-the-money stock options condition (53%) and finally the participants in the in-the-money stock options condition (42%) were less risk-seeking. This pattern fits the prediction that as wealth at stake increases, managers will be less risk-seeking. Based on a Chi-squared test, the difference between at-the-money stock options with a recontracting provision and in-the-money stock options is only marginally significant ($p = 0.10$), providing only some support for H3 in the loss condition.

In the gain condition, participants with at-the-money stock options with a recontracting provision (34%) and at-the-money stock options (35%) were less risk seeking than participants with in-the-money stock option (48%). However, none of the conditions were significantly different. Although this result does not support H3 in the gain condition, this evidence is consistent with the view that risk preference in the gain context is already less risk-seeking due to the loss aversion effect. This risk preference may be very strong and increasing wealth at stake does not substantially change that preference to an even less risk-seeking position. But, compare the pattern in the gain condition with the pattern in the loss condition. Risk preference in the loss

context is more risk-seeking due to the loss aversion effect. In the loss condition, where individuals are more risk-seeking, risk-bearing may have the potential to have a greater impact and mediate the impact of loss aversion.

The third behavioral agency prediction is that relative risk-bearing will influence risk-seeking behavior. Taking the view that stock options are subjectively overvalued relative to restricted stock, we predict that more managers endowed with restricted stock will exhibit risk-seeking behavior compared to managers endowed with stock options (H4). We compare managers' choices between restricted stock and in-the-money stock options and find that the difference is marginally significant in the loss condition ($P = 0.08$). However, in the gain condition, we find no significant evidence of relative risk-bearing effects. Hence, these results provide only some support for the third behavioral model prediction.

Taken together, we do not find support for the traditional agency model's prediction that the type of stock-based compensation alone predicts risk-seeking behavior. However, when we consider the behavioral agency model's relaxation of the stable risk preferences assumption underlying the traditional agency model prediction, we find that loss aversion and risk-bearing together impact managerial risk-seeking behavior. Specifically, loss averse managers are more (less) risk-seeking in the loss (gain) context. However, when coupled with greater risk-bearing, managers in the loss context end up exhibiting less risk-seeking. Moreover, subjective valuation of stock options relative to restricted stock results in less risk-seeking behavior, contrary to traditional agency model predictions.

4.4 *Additional Analyses*

Do factors other than loss aversion impact managerial risk-seeking behavior in a loss context?

Support for H2 suggests that more managers with stock-based compensation exhibit risk-seeking behavior in the loss context because of loss aversion. However, this behavioral agency model prediction is also consistent with the traditional agency model prediction. Specifically, managers with stock options are risk-seeking because they are risk-averse and face a convex payoff function. To test this alternative explanation, we asked participants to briefly provide the reason(s) for their project choice (see Appendix B). The process for content analysis first involved two of the researchers and two coders. The four individuals went through 10 randomly selected participant responses to identify initial categories of responses and modify them to make them clearer until the point where two coders, working independently, analyzed the same responses and arrived at a consensus on how they are to be coded. The categories of ‘risk aversion,’ ‘expected value,’ and ‘loss aversion,’ and ‘other’ were eventually determined to most accurately represent the concepts of interest. The final level of inter-coder agreement was 86% demonstrating a high level of reliability of coding.

Table 6 reports a break down of the content analysis by type of stock-based compensation, project choice and gain loss condition. The results indicate that in the gain context participants choosing project A (less risky choice) reported that they made the choice to avoid risk (ATMR 66%, ATM 62%, ITM 48%, RS 53%). Participants choosing project B (more risky choice with higher expected value), however, reported they made the choice because of a higher expected value (ATMR 31%, ATM 36%, ITM 48%, RS 41%). In the loss context participants choosing project A (less risky choice with higher expected value) reported that they made the choice to avoid risk or because of higher expected value (ATMR 21%, 16%; ATM 28%, 20%; ITM 23%, 27%; RS 23%, 10%, respectively). Participants choosing project B (more risky choice), however, reported they made the choice to avoid a loss (ATMR 63%, ATM 38%, ITM

32%, RS 38%). These results further confirm the hypothesis that individuals are behaving differently between the gain and loss conditions ($p < 0.001$). In the gain condition, participants are more concerned with avoiding risk than maximizing expected value and in the loss condition, participants were more concerned with avoiding loss than avoiding risk or maximizing expected value. Overall, the content analysis suggest that the reasons provided by the participants are consistent with the behavioral agency model predictions rather than the alternative traditional agency model-based explanation.

Does base pay in addition to stock-based pay impact managerial risk-seeking behavior?¹⁷

We indicated to each participant that the stock-based compensation was *in addition to* a base salary. Although the amount of salary was not explicitly indicated in the experimental materials, it is possible that participants based project choices on fixed based pay rather than variable stock-based pay. Since future base pay is arguably insulated from the threat of loss, participants' risk-bearing is reduced and as a result, participants may choose riskier projects in both gain and loss contexts (Wiseman Gomez-Mejia 1998). To determine whether base pay impacted the participants' project choices, we conducted a content analysis of the responses as described above. Upon closer examination of the 'other' category of participant responses, we determined that only two participants mentioned salary as the reason for their project choice. Hence, risk-bearing in stock-based pay, rather than risk-insulation in future base pay, appears to drive managerial risk-seeking behavior in our study.

¹⁷ We also consider age, since it may be considered a proxy for outside wealth with older managers more likely to have amassed wealth over the course of their career, and therefore exhibit less risk-seeking behavior because they are more concerned about wealth preservation rather than wealth accumulation. Moreover, older managers may be less risk-seeking (Hodge, Rajgopal and Shevlin 2005) in both gain and loss context. Untabulated results indicate that when age is used as a covariate in logit regressions testing the hypotheses, the results are qualitatively similar to the chi-squared results without age as a covariate. Based on untabulated correlation analysis, age is highly correlated ($p < 0.10$) with work experience, managerial experience, capital investment experience, education level and experience with stock-based compensation. Overall, age does not impact managerial risk-seeking behavior in our study.

Taken together, the additional analyses described above confirm our main result that loss aversion and risk-bearing in stock-based compensation impact managerial risk-seeking behavior. The implications of our findings are that there are economic circumstances (i.e., decision contexts) that impact the risk-seeking behavior of managers, especially for those with current wealth at stake. This is consistent with recent theoretical research, which generally suggests that the impact of stock-based compensation on managerial risk-seeking behavior does not necessarily hold under all economic conditions, and that both stock options and restricted stock play a role in optimal compensation design (Barron and Waddell 2003).

5.0 Conclusion

The current debate about the efficacy of stock options in providing incentives for managers to accept positive but risky net present value projects is one explanation cited for the shift of many firms away from stock options and towards other stock-based compensation such as restricted stock. However, extant empirical and theoretical research about the efficacy of these forms of stock-based compensation in providing such incentives are limited and mixed. Our study seeks to improve on the ability of traditional agency-based models in explaining managerial risk-seeking behavior by relaxing the assumption of stable risk preferences and incorporating the concepts of loss aversion and risk-bearing in stock-based compensation as proposed in behavioral agency-based models

Our findings support the predictions of the behavioral agency model in that more managers with stock-based compensation exhibit risk-seeking behavior in negatively framed problems (loss context) compared to managers in positively framed problems (gain context). Further, there is evidence that more managers with stock options or restricted stock in negatively framed problems (loss context) display risk-seeking behavior when compared to managers in

positively framed problems (gain context). These results are inconsistent with the traditional agency model predictions. In addition, the findings provide marginal support for the predictions of the behavioral agency model in that as risk bearing (manager's perceived wealth at stake) increases, managers will be less risk-seeking in the loss condition. Finally, our findings are consistent with the view that managers subjectively overvalue stock options relative to the objective value and relative to restricted stock.

Of importance, the investment project choice sets were designed so that the optimal choice from an expected value perspective was the certain outcome investment in the loss context and the uncertain outcome investment in the gain context. Since firms are normally expected to have more gain than loss situations, it appears that providing stock options will not necessarily lead to more risk-seeking behavior consistent with shareholder interests when compared to providing restricted stock.

A potential limitation should be considered in interpreting the findings. Relatively few participants have actually received stock-based compensation (27% stock options and 7% restricted stock). Thus, it is not known whether additional exposure to stock-based compensation may affect the findings, which awaits future research.

This study has expanded the traditional agency model by examining managerial risk-seeking behavior by relaxing the assumptions of stable risk preferences as well as examining how perceived wealth at stake may reduce manager's risk-seeking behavior. This study has some very practical implications as well. First, for those charged with designing effective compensation schemes, a deep understanding of the effects of different economic contexts and types of stock-based compensation on managerial risk-seeking behavior continues to be imperative. Specifically, a manager's perceived wealth at stake rather than the objective value of

wealth at stake needs to be considered when designing a compensation scheme that seeks to influence the manager's risk-seeking behavior. Second, the expense reported on the financial statements related to stock-based compensation is derived from objective valuation models (e.g., Black Scholes model). Financial statement users may incorporate this objective valuation into their beliefs about manager's future behavior and, as a result, the future value of the firm. However, subjective valuation matters in risk-seeking behavior which in turn impacts firm value. Finally, new SEC rules require disclosing the differing types and the rationale for stock-based compensation. How then will the firm link compensation to manager's actions without considering the manager's subjective valuations?

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Figure 1

Graph of Stock-Based Compensation Values and Payoffs

This graph depicts the dollar values and payoffs for 100,000 stock options and 10,000 shares of restricted stock at various stock prices. See Appendix A for other model inputs assumed. The convexity in the stock option payoff function comes from the fact that when the options are underwater (price-to-strike ratio of less than 1) or at-the-money (price-to-strike ratio of 1), options have a zero payoff because the optionholder has no incentive to exercise the options; but when the options are in-the-money (price-to-strike ratio greater than 1), the optionholder exercises the options and the upward slope on the payoff function becomes steep. Hence, an \$11 stock price results in a \$100,000 payoff. The Black-Scholes stock option value is provided to show that it is also convex along the range of price-to-strike ratios. In contrast, the linearity in the restricted stock payoff (and value) function comes from the fact that the restricted stock is valued at the prevailing stock price. Hence, an \$11 stock price results in an \$110,000 payoff.

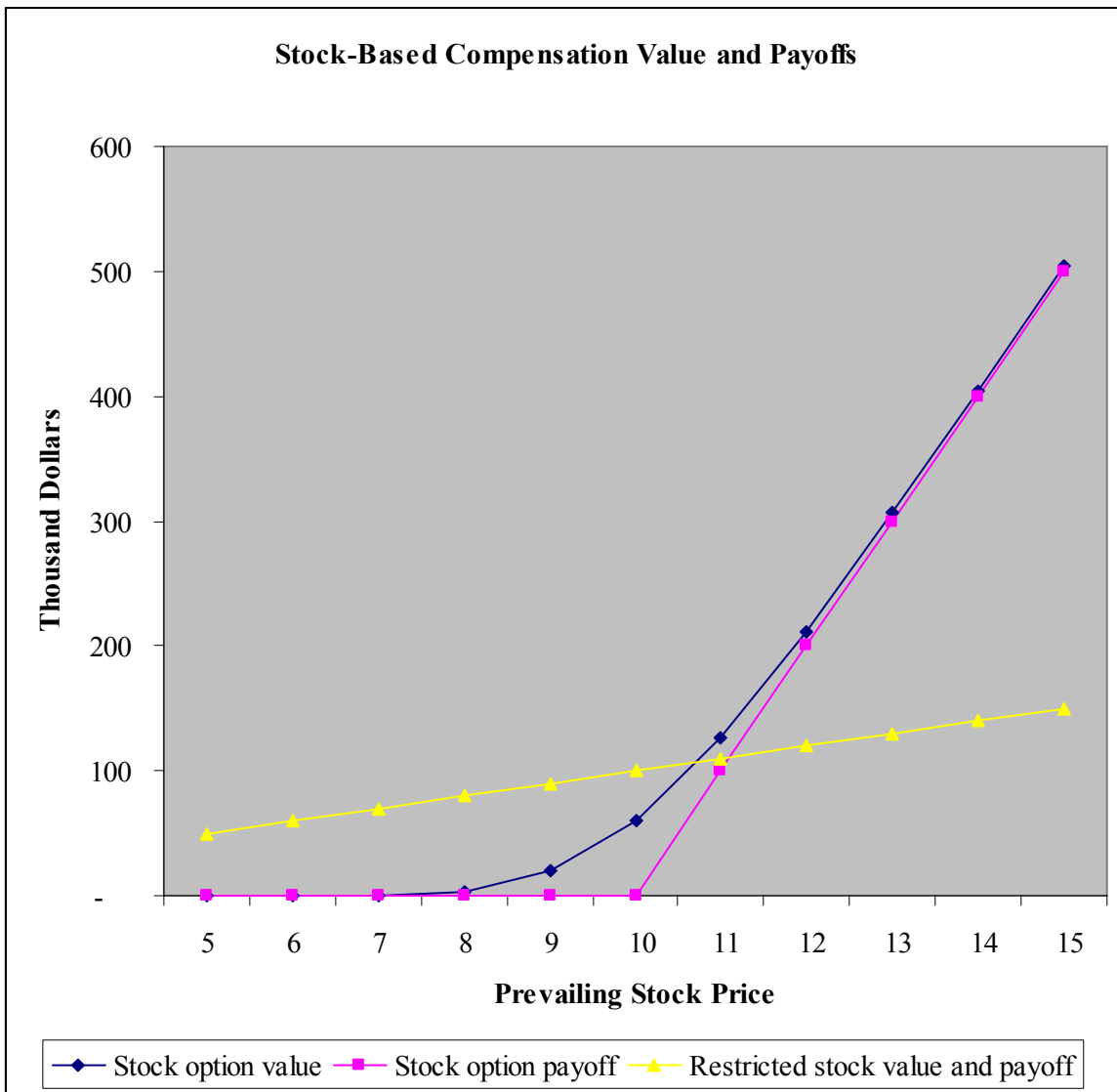


Table 1
Summary of Project Choices, Outcomes and Hypotheses

Frame	At-the-money with a recontracting provision		At-the-money stock options		In-the-money stock options		Restricted stock	
	Project A (riskless)	Project B (risk-seeking)	Project A (riskless)	Project B (risk-seeking)	Project A (riskless)	Project B (risk-seeking)	Project A (riskless)	Project B (risk-seeking)
Net Gain Effect	\$2,400,000	25%\$10,000,000 75% \$0	\$2,400,000	25%\$10,000,000 75% \$0	\$2,400,000	25%\$10,000,000 75% \$0	\$2,400,000	25%\$10,000,000 75% \$0
EPS	\$5.24	25% \$6.00 75% \$5.00	\$5.24	25% \$6.00 75% \$5.00	\$5.24	25% \$6.00 75% \$5.00	\$5.24	25% \$6.00 75% \$5.00
Stock Price	\$10.24	25% \$11.00 75% \$10.00	\$10.24	25% \$11.00 75% \$10.00	\$11.24	25% \$12.00 75% \$11.00	\$13.40	25% \$21.00 75% \$11.00
Initial Wealth	\$0	\$0	\$0	\$0	\$100,000	\$100,000	\$110,000	\$110,000
Ending Wealth*	\$24,000	25% \$100,000 75% -0-	\$24,000	25% \$100,000 75% -0-	\$124,000	25% \$200,000 75% \$100,000	\$134,000	25% \$210,000 75% \$110,000
Net Gain in Wealth**	\$24,000	25% \$100,000 75% -0-	\$24,000	25% \$100,000 75% -0-	\$24,000	25% \$100,000 75% -0-	\$24,000	25% \$100,000 75% -0-

Test for H1: # of participants with stock options choosing Project B > # of participants with restricted stock choosing Project B

Test for H2: # of participants in the gain context choosing Project B < # of participants in the loss context choosing Project B

Test for H3: # of participants with at-the-money stock options choosing Project B > # participants with in-the-money stock options choosing Project B

Test for H4: # of participants with restricted stock choosing Project B > # of participants with restricted stock choosing Project B

* Ending wealth is equal to the stock price multiplied by the number of stock options or restricted stock, and after any exercise price deductions.

** Net gain or loss in wealth is equal to the ending wealth less the initial wealth after any exercise price deductions.

Table 1, Continued
Summary of Project Choices, Outcomes and Hypotheses

Frame	At-the-money with a recontracting provision		At-the-money stock options		In-the-money stock options		Restricted stock	
	Project A (riskless)	Project B (risk-seeking)	Project A (riskless)	Project B (risk-seeking)	Project A (riskless)	Project B (risk-seeking)	Project A (riskless)	Project B (risk-seeking)
Net Loss Effect	\$7,400,000	75%\$10,000,000 25% \$0	\$7,400,000	75%\$10,000,000 25% \$0	\$7,400,000	75%\$10,000,000 25% \$0	\$7,400,000	75%\$10,000,000 25% \$0
EPS	\$4.26	75% \$4.00 25% \$5.00	\$4.26	75% \$4.00 25% \$5.00	\$4.26	75% \$4.00 25% \$5.00	\$4.26	75% \$4.00 25% \$5.00
Stock Price	\$9.26	75% \$9.00 75% \$10.00	\$9.26	75% \$9.00 75% \$10.00	\$10.26	75% \$10.01 25% \$11.00	\$3.60	75% \$1.00 25% \$11.00
Initial Wealth	\$0	\$0	\$0	\$0	\$100,000	\$100,000	\$110,000	\$110,000
Ending Wealth*	\$0	\$0	\$0	\$0	\$26,000	75% \$1,000 25% \$100,000	\$36,000	75% \$10,000 25% \$100,000
Net Loss in Wealth**	\$0	\$0	\$0	\$0	\$74,000	75% \$100,000 25% -0-	\$74,000	75% \$100,000 25% -0-

Test for H1: # of participants with stock options choosing Project B > # of participants with restricted stock choosing Project B

Test for H2: # of participants in the gain context choosing Project B < # of participants in the loss context choosing Project B

Test for H3: # of participants with at-the-money stock options choosing Project B > # participants with in-the-money stock options choosing Project B

Test for H4: # of participants with restricted stock choosing Project B > # of participants with restricted stock choosing Project B

* Ending wealth is equal to the stock price multiplied by the number of stock options or restricted stock, and after any exercise price deductions.

** Net gain or loss in wealth is equal to the ending wealth less the initial wealth after any exercise price deductions.

Table 2
Participant Demographic Data

Number of participants by experimental condition:

Gain Context—

Stock options

At-the-money with a recontracting provision 29

At-the-money 43

In-the-money 27

Total stock options 99

Restricted stock 52

Loss Context—

Stock options

At-the-money with a recontracting provision 25

At-the-money 40

In-the-money 24

Total stock options 89

Restricted stock 52

Total 292

	<u>Mean</u>	<u>Std. Dev.</u>	<u>Median</u>
Years of work experience	6.13	6.08	5.00
Years of management experience	2.29	4.54	0.50
Strength of belief that the outcome of the project choice will affect the company's stock price (Response scale: 0 no effect; 50 direct but limited effect; 100 direct and significant effect)	64.63	21.99	70.00
		<u>%</u>	
Types of experience making capital investment decisions			
No experience		55%	
Provided data		26%	
Participated in evaluation		30%	
Made recommendation		23%	
Approved and passed on for final approval		10%	
Made final decision		8%	
Types of compensation received in the past			
Hourly		55%	
Salary		82%	
Cash bonus		59%	
Stock options		27%	
Restricted stock		7%	
Other		7%	

Table 3
Results of Manipulation Checks and Knowledge Questions

Panel A: Manipulation Checks (see Appendix C)

Experimental Condition	Context Correct (gain or loss)	Compensation Correct (SO or RS)
Stock Options		
At-the-money with recontracting	85%	67%
At-the-money	92%	79%
In-the-money	90%	81%
Restricted Stock	86%	69%
All Compensation	88%	73%

Panel B: Knowledge Questions (see Appendix C)

Experimental Condition	Understanding of:		
	At-the-money stock options	Restricted stock	At-the-money with recontracting
At-the-money with recontracting	96%	59%	91%
At-the-money	95%	65%	89%
In-the-money	90%	72%	81%
Restricted Stock	85%	73%	81%

Table 4
Participant Choice of Investment Project and Tests of Hypotheses 1 and 2

Percent of participants choosing project B (more risk-seeking)

Context	Stock Options	Restricted Stock	Hypothesis Test	All Stock-Based Compensation
Gain	38%	42%		40%
Loss	53%	62%		56%
Hypothesis Test				(H2): Gain < Loss (0.004)
All Contexts	45%	52%	(H1): RS > SO (0.16)	48%

Notes: One-tailed p-values from the chi-square tests of the hypotheses are reported in parentheses. If participants were to make a choice solely based on higher expected values, the rational choice in the gain contexts would be project B (more risk-seeking) and the rational choice in the loss contexts would be project A (less risk-seeking).

Table 5
Participant Choice of Investment Project and Tests of Hypotheses 3
Examining All Stock-Based Compensation

Percent of participants choosing project B (more risk-seeking)

Context	Stock Options ATMR	Stock Options ATM	Stock Options ITM	Restricted Stock
Gain	34%	35%	48%	42%
Loss	64%	53%	42%	62%

Chi-squared tests

Fisher's Exact Test

Gain context

At-the-money with provision for recontracting
 Compared to in-the-money stock options

p = 0.22 **(H3)**

In-the-money stock options
 Compared to restricted stock

p = 0.39 **(H4)**

Loss context

At-the-money with provision for recontracting
 Compared to in-the-money stock options

p = 0.10 **(H3)**

In-the-money stock options
 Compared to restricted stock

p = 0.08 **(H4)**

Table 6

**Participant Reason for Choice of Investment Project
Examining All Stock-Based Compensation and Project Choice**

Percent of Participants Indicating Reason

Decision context	Reasons	Type of Stock Compensation				
		SO-ATMR	SO-ATM	SO-ITM	Restricted Stock	
Gain		Risk avoidance	66%	62%	48%	53%
	Project A	Expected value		2%		4%
		Loss avoidance				
Gain		Risk avoidance	3%			2%
	Project B	Expected value	31%	36%	48%	41%
		Loss avoidance			4%	
Loss		Risk avoidance	21%	28%	23%	23%
	Project A	Expected value	16%	20%	27%	10%
		Loss avoidance			14%	6%
Loss		Risk avoidance				2%
	Project B	Expected value		14%	4%	21%
		Loss avoidance	63%	38%	32%	38%

Appendix A

Example of Stock-Based Compensation Values and Payoffs

Stock options represent a right to purchase a unit of common stock in the future at a predetermined strike price. Restricted stock is a direct award of a unit of common stock. Both have vesting restrictions. This example presents the dollar values and payoffs for 100,000 stock options and 10,000 shares of restricted stock at various stock prices. The stock option value is based on the Black-Scholes model^a and the following model inputs: dividend yield of zero percent, expected stock return volatility of 0.50, risk-free interest rate of 5 percent, and \$10 strike price. To simplify the example and highlight the difference in the payoff functions, we assume that the stock options are expiring and exercisable and that the restricted stocks are fully vested. The stock option payoff is based on the modified intrinsic value and is equal to the excess of the prevailing stock price over the exercise price. The restricted stock value and the restricted stock payoff are both equal to the prevailing stock price. The convexity in the stock option payoff function comes from the fact that when the options are underwater (price-to-strike ratio of less than 1) or at-the-money (price-to-strike ratio of 1), options have zero payoff because the optionholder has no incentive to exercise the options; but when the options are in-the-money (price-to-strike ratio greater than 1), the optionholder exercises the options and the upward slope on the payoff function becomes steep. Hence, an \$11 stock price results in a \$100,000 payoff. The Black-Scholes stock option value is provided to show that it is also convex along the range of price-to-strike ratios (see Figure 1). In contrast, the linearity in the restricted stock payoff (and value) function comes from the fact that the restricted stock is valued at the prevailing stock price. Hence, an \$11 stock price results in an \$110,000 payoff. According to traditional agency theory, both the downside loss protection and the upside gain potential with stock options encourage risk-seeking behavior while the lack of downside loss protection and less upside gain potential discourage risk-seeking behavior with restricted stock.

Stock Options

Price-to-Strike ratio	0.36	0.93	1.00	1.02	1.03	1.10	1.12	1.34
Stock Price (S)	\$ 3.60	\$ 9.26	\$ 10.00	\$ 10.24	\$ 10.26	\$ 11.00	\$ 11.24	\$ 13.40
Exercise Price (X)	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00
Number of options	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Stock option value	\$ 0	\$ 27,218	\$ 59,516	\$ 73,261	\$ 74,475	\$ 126,108	\$ 145,268	\$ 345,371
Stock option payoff	\$ -	\$ -	\$ -	\$ 24,000	\$ 26,000	\$ 100,000	\$ 124,000	\$ 340,000

Restricted Stock

Stock Price	\$ 3.60	\$ 9.26	\$ 10.00	\$ 10.24	\$ 10.26	\$ 11.00	\$ 11.24	\$ 13.40
Number of shares	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Restricted stock value	\$ 36,000	\$ 92,600	\$ 100,000	\$ 102,400	\$ 102,600	\$ 110,000	\$ 112,400	\$ 134,000
Restricted stock payoff	\$ 36,000	\$ 92,600	\$ 100,000	\$ 102,400	\$ 102,600	\$ 110,000	\$ 112,400	\$ 134,000

^a Similar to Core and Guay (2002), estimates of a stock option's value are calculated based on the Black-Scholes formula for valuing European call options, as modified to account for dividend payouts by Merton (1973). The Black-Scholes option value is defined as:

$$\text{Option value} = [Se^{-dT} N(Z) - Xe^{-rT} N(Z - \sigma T^{(1/2)})],$$

where

$$Z = \frac{[\ln(S/X) + T(r - d + \sigma^2/2)]}{\sigma T^{(1/2)}},$$

N = cumulative probability function for the normal distribution

S = price of the underlying stock

X = strike price of the option

d = log of expected dividend yield over the life of the option

σ = expected stock-return volatility over the life of the option

r = log of risk-free interest rate

T = time to maturity of the option in years

Appendix B
Example of the Instrument
[At-the-money Stock Options/Gain Context]

MAKE SURE TO COMPLETE PART 1 BEFORE PROCEEDING TO PART 2

Part 1:

You are the manager of the Northwest division of ZIAM Inc. ZIAM Inc is a multi-product company that has grown over the last few years by making strategic alliances and integrating with suppliers and distribution channels. This growth strategy has worked well and ZIAM has a reputation for solid financial performance.

Each division manager receives both a salary and stock-based compensation. You receive **STOCK OPTIONS** as part of your compensation package. Currently your stock options give you the right to purchase 100,000 of the company's stock for an exercise price of \$10 each. **Your stock options are considered AT-THE-MONEY** since the exercise price is equal to the current stock price of \$10. Your stock options are about to expire in the near future.

As the Northwest division manager you must make investment decisions for your division. Currently you are evaluating two investment projects, both of which are critically important to your company's overall strategic plan. Both projects involve the same level of investment and are the same in all dimensions except for the projected outcomes. As part of your consideration of the two projects, you ask the corporate accountant to estimate the potential NET GAIN EFFECT for each project, the projected impact on earnings per share (EPS) and the projected stock price given the historical relationship between EPS and stock price for ZIAM Inc.

To simplify matters, the accountant has provided you with your projected wealth in stock-based compensation based on each investment project choice as well as the net gain in your wealth in stock-based compensation based on each investment project choice. You have worked with this accountant for a number of years and have found his estimates to be very reliable. The accountant believes the impact of the investment project choice on the stock price will occur within two months. Current EPS is \$5.00 and the current stock price is \$10. The accountant's analysis is on the following page.

Appendix B (continued)
Example of the Instrument
 [At-the-money Stock Options/Gain frame]

Accountant's Analysis of the Impact of the Investment Projects

The current value of your stock options is \$0 or \$10 share price less \$10 option exercise price times 100,000 options.

	<u>Project A</u>	<u>Project B</u>
NET GAIN EFFECT	\$2,400,000 gain for sure	25% chance of \$10,000,000 gain and 75% chance of zero net gain effect
Projected EPS	\$5.24	25% chance of \$6.00 and 75% chance of \$5.00
Projected Stock Price	\$10.24	25% chance of \$11 and 75% chance of \$10
The Projected Value of Your Options	\$24,000	25% chance of \$100,000 and 75% chance of zero wealth
Net Gain in Your Wealth	\$24,000	25% chance of \$100,000 and 75% chance of zero net gain

Please answer the following questions:

You must make a choice between investment projects A and B by checking one box below: Remember your compensation includes stock options that are currently at-the-money (i.e., the exercise price equals the current stock price). In addition, as described earlier you will receive a payment for participating in the study (additional compensation) based on the outcome of your investment decision. The better the outcome, the more you will be paid. As in practice, the objective is to maximize your total compensation (salary + stock compensation + additional compensation).

Project A

Project B

Briefly describe the reasons for your choice

Once you have completed this page, please place it in the attached sealed envelope and proceed to part 2 of the study.

Appendix C

Manipulation Check Questions (Part 2)

1. Using the scale below, indicate how strongly you believe the outcome of your investment choice will affect the company's stock price.

0	10	20	30	40	50	60	70	80	90	100
Has no effect				Has a direct but limited effect						Has a direct and significant effect

As an incentive managers often receive stock-based compensation in addition to salaries and bonuses. Below is a summary of some of the common forms of stock-based compensation:

Stock options with a RECONTRACTING PROVISION: a right to purchase common stock with a GUARANTEE THAT SHOULD THE STOCK PRICE FALL THE EXERCISE PRICE WILL BE REDUCED to ensure it is equal to the current stock price.

Stock options AT-THE-MONEY: a right to purchase common stock where the exercise price is equal to the current stock price.

Stock options IN-THE-MONEY: a right to purchase common stock where the exercise price is LESS THAN the current stock price. Therefore, the employee can exercise the stock option and buy common stock at a bargain price.

Restricted stock: A DIRECT AWARD OF COMMON STOCK.

2. In this study as a manager you were provided with stock-based compensation. Indicate below which form of compensation you received before you made the investment choice. (check one)

- Stock options at-the-money with a recontracting provision
- Stock options at-the-money
- Stock options in-the-money
- Restricted stock

3. In this study as a manager you had to choose between two investment projects. Indicate below the potential impact on the company of the investment choice presented to you in the case. (check one)

- net loss effect
- net gain effect

Once you have completed this page, please continue to the next page and do not return to this page.

Please complete the following final set of questions.

Stock options said to be “at-the-money” indicate:

- a. The exercise price to purchase common stock is less than the current stock price
- b. The exercise price is greater than the current stock price
- c. The exercise price is equal to the current stock price
- d. The relationship between the exercise price and current stock price cannot be determined

Restricted stock compensation entails:

- a. an opportunity to purchase common stock at a set price
- b. an outright award of common stock
- c. common stock that must be sold by a certain date
- d. common stock that does not contain voting privileges

Stock options that contain a recontracting provision entail:

- a. a guarantee by the company that if the stock price falls the exercise price will be reduced to ensure it is equal to the current stock price
- b. an opportunity to purchase common stock at a set price
- c. a requirement that common stock purchased through stock options must be sold by a certain date
- d. a guarantee by the company that options will allow employees to purchase common stock at a “bargain” price, i.e., a price less than the current stock price

How many years of work experience do you have? _____

How many years of management experience do you have? _____

Indicate below the types of experience you have had making capital investment decisions.
(Check all that apply)

- | | |
|--|--|
| <input type="checkbox"/> No experience | <input type="checkbox"/> Provided data |
| <input type="checkbox"/> Participated in evaluation | <input type="checkbox"/> Made recommendation |
| <input type="checkbox"/> Approved and passed on for final approval | <input type="checkbox"/> Made final decision |

Please indicate the types of compensation you have received in the past. (check all that apply)

- Hourly Salary Cash bonus Stock options Restricted stock
 Other, specify _____

What is the highest level of education you have obtained? (Check one)

- | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|----------------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Some
College | Undergraduate
degree | Some graduate
courses | Master's
degree | Professional
degree (LLM, JD) | Other |

How many formal accounting classes have you completed? (Check one)

- 0 1-3 4-7 8-11 12 or more

How many formal finance classes have you completed? (Check one)

- 0 1-3 4-7 8-11 12 or more

In your accounting or finance courses how often was the topic of capital investment decisions discussed such as the situation for the current case you just completed? (Check one)

- Never (1-4 times) Frequently (5-10 times) (11-15 times) Extensively (over 15 times)

Please indicate your gender.

- Male Female

Please indicate your age range.

- 20-25 26-30 31-35 36-45 46-55 over 55

Thank you for your participation. Please return all materials to the proctor.

Appendix D
Example of the Instrument
[Restricted Stock/Loss Context]

MAKE SURE TO COMPLETE PART 1 BEFORE PROCEEDING TO PART 2

Part 1:

You are the manager of the Northwest division of ZIAM Inc. ZIAM Inc is a multi-product company that has grown over the last few years by making strategic alliances and integrating with suppliers and distribution channels. This growth strategy has worked well and ZIAM has a reputation for solid financial performance.

Each division manager receives both a salary and stock-based compensation. You receive **RESTRICTED STOCK** as part of your compensation package. The restricted stock is a grant to you of company stock. Restricted stock must be held for a vesting period, which is a period of time before being allowed to sell the stock. Currently you are fully vested in 10,000 shares of restricted stock. The current stock price is \$11 per share.

As the Northwest division manager you must make investment decisions for your division. Currently you are evaluating two investment projects, both of which although resulting in a net loss (cost to the company) or no gain are critically important to your company's overall strategic plan. Both projects involve the same level of investment and are the same in all dimensions except for the projected outcomes. As part of your consideration of the two projects, you ask the corporate accountant to estimate the potential NET LOSS EFFECT for each project, the projected impact on earnings per share (EPS) and the projected stock price given the historical relationship between EPS and stock price for ZIAM Inc.

To simplify matters, the accountant has provided you with your projected wealth in stock-based compensation based on each investment project choice as well as the net loss in your wealth in stock-based compensation based on each investment project choice. You have worked with this accountant for a number of years and have found his estimates to be very reliable. The accountant believes the impact of the investment project choice on the stock price will occur within two months. Current EPS is \$5.00 and the current stock price is \$11. The accountant's analysis is on the following page.

Appendix D (continued)
Example of the Instrument
 [Restricted Stock/Loss context]

Accountant's Analysis of the Impact of the Investment Projects

The current value of your restricted stock is \$110,000 or \$11 share price times 10,000 shares.

	<u>Project A</u>	<u>Project B</u>
NET LOSS EFFECT	\$7,400,000 loss for sure	75% chance of \$10,000,000 loss and 25% chance of zero net loss
Projected EPS	\$4.26	75% chance of \$4.00 and 25% chance of \$5.00
Projected Stock Price	\$3.60	75% chance of \$1 and 25% chance of \$11.00
The Projected Value of Your Restricted Shares	\$36,000	75% chance of \$10,000 and 25% chance of \$110,000
Net Loss in Your Wealth	\$74,000	75% chance of \$100,000 loss and 25% chance of zero net loss

Please answer the following questions:

You must make a choice between investment projects A and B by checking one box below:
 Remember your compensation includes shares of restricted stock that are currently worth \$11 per share. In addition, as described earlier you will receive a payment for participating in the study (additional compensation) based on the outcome of your investment decision. The better the outcome, the more you will be paid. As in practice, the objective is to maximize your total compensation (salary + stock compensation + additional compensation).

Project A

Project B

Briefly describe the reasons for your choice

Once you have completed this page, please continue to the next page and do not return to this page.