

Does Greater Risk-Bearing in Stock Option Compensation Reduce the Influence of Problem Framing On Managerial Risk-Taking Behavior?

Kimberly Sawers

Seattle Pacific University

Arnold Wright

Northeastern University

Valentina Zamora

Seattle University

ABSTRACT: We examine the extent to which the behavioral agency model reflects the relation between greater risk-bearing in stock option compensation and managerial risk-taking. The behavioral agency model predicts that managers with greater wealth at stake will avoid risky projects that threaten their wealth. This greater risk-bearing effect moderates the problem-framing effect, which predicts that loss-averse managers will be more (less) risk-taking when choosing among loss (gain) projects. Using a 2×2 between-subjects experiment with 108 M.B.A. students acting as managers, we find that managers are more risk-taking in the loss context than in the gain context when they have at-the-money stock options but not when they have wealth at stake through in-the-money stock options. Further, we find that managers with in-the-money stock options are less risk-taking than managers with at-the-money stock options in the loss context. These findings support the behavioral agency model prediction that greater risk-bearing in stock option compensation (moving from at-the-money stock options to in-the-money stock options) reduces the problem framing effect on risk-taking behavior, particularly when the firm faces a loss decision context. Our results point to the importance of considering the implications of risk-bearing in stock option compensation for managers choosing risky projects that affect firm value.

Keywords: loss aversion; instant endowment; risk-bearing; risk-taking; stock-based compensation; stock options.

We thank seminar participants at Boston College, Northeastern University, the 2005 American Accounting Association Annual Meeting, the 2006 Accounting, Behavior and Organization Section Meeting, and the 2007 Managerial Accounting Section Meeting. Frank Hodge, Jane Kennedy, Shiva Rajgopal, Ken Schwartz, Terry Shevlin, Greg Trompeter, Gerardo Ungson, Pete Wilson, and Robert Wiltbank provided helpful written comments. Valentina Zamora acknowledges support from the Boston College Office of Sponsored Programs. Anagha Dutt, Marco Mura, Jack McManus, and Scott Wright provided very able research assistance.

Published Online: February 2011

Data Availability: Data are available from the authors.

JEL Classifications: M4.

INTRODUCTION

In this study, we examine the role of stock option compensation in managerial risk-taking. Specifically, we investigate whether greater risk-bearing in stock options (i.e., manager's wealth at stake) moderates the impact of problem framing on risk-taking behavior. Managerial risk-taking behavior has important capital investment and, thus, resource allocation implications and yet is not singularly explained by extant theories (Shimizu 2007). For example, agency theory generally predicts that stock options provide incentives for risk-averse managers to take risky, positive net present value projects (e.g., Jensen and Meckling 1976).¹ Meanwhile, prospect theory generally purports that loss-averse managers will be more (less) risk-taking when choosing among loss (gain) projects (e.g., Kahneman and Tversky 1979).

We propose that managerial risk-taking is influenced both by the firm's problem frame and the manager's risk-bearing in stock options. We draw this view from the behavioral agency model developed by Wiseman and Gomez-Mejia (1998).² Our study focuses on two important elements of the model: stock-based compensation, which is part of compensation design, and problem framing. Examining the effects of stock option compensation and problem framing on managerial risk-taking behavior is important for accounting researchers and practitioners alike. First, Kinney (2001) suggests that examining the decision-maker's utility function is important in the domain of accounting scholarship because it is one of the factors in the information context surrounding decisions that ultimately impact firm value. However, despite stock option compensation being a significant part of the manager's utility function, its efficacy in inducing risky but firm value-increasing managerial decisions remains in question (Hall and Murphy 2003). Prior research offers mixed results (e.g., Wright et al. 1996; Palmer and Wiseman 1999; Datta et al. 2001; Knopf et al. 2002) and suggests that granting stock options may actually reduce risk-taking behavior. One possible explanation is that managers consider stock options as current wealth at stake in decisions involving risk (e.g., Carpenter 2000; Ross 2004). Stock options of different values (at-the-money versus in-the-money) may represent different levels of current wealth at stake or risk-bearing. As a result, researchers may find different managerial risk-taking behaviors emerging. Such insights are also important to practitioners charged with designing and assessing compensation contracts (e.g., Ross 2004; Becker 2006).

Second, examining how problem framing effects apply in the presence of other contextual factors has been a focus in psychology research (e.g., Fagley and Miller 1987; Wang 1996), and is particularly relevant in accounting. Prior research finds robust results for problem framing in managerial decisions (Lipe 1993; Sullivan and Kida 1995), tax compliance decisions (Shepanski and Kelsey 1990; Christian and Gupta 1994), and audit-client acceptance decisions (Cohen and Trompeter 1998). However, recent research provides evidence consistent with contextual factors overshadowing problem-framing effects on managerial risk-taking behavior. For example, Moreno et al. (2002) examine one contextual factor and find that affective reactions reverse problem

¹ The positive agency literature generally predicts that risk aversion reduces the agent's (manager's) incentives to invest in risky but firm value-increasing projects (e.g., Jensen and Meckling 1976; Smith and Stulz 1985; Milgrom and Roberts 1992; Hemmer et al. 1999; Parrino et al. 2005). Thus, principals have to provide incentives, such as stock options, to align the agent's interests with those of the principals (Hall and Liebman 1998; Murphy 1999) so that the agents will accept risky projects that increase firm value.

² The full behavioral agency model is explained in greater detail in a later section.

framing predictions in capital budgeting decisions.³ We examine another contextual factor: the dampening effect of risk-bearing in stock option compensation. Drawing from the behavioral agency model, we propose that as a manager's endowed wealth increases, so does risk-bearing (e.g., moving from at-the-money stock options to in-the-money stock options). This, in turn, will reduce the manager's preference for choosing risky projects, despite the firm being in a loss decision context.

In a 2×2 (risk-bearing, problem framing) between-subjects experiment using 108 M.B.A. students acting as managers, participants choose between two capital investment options (riskless, risky). Participants receive either at-the-money stock options (low risk-bearing) or in-the-money stock options (high risk-bearing) and are provided capital investment options that resulted in either a gain or a loss (positive problem frame, negative problem frame). We find that risk-bearing in the form of stock option compensation moderates the influence of problem framing on risk-taking. Specifically, managers are more risk-taking in the loss context than in the gain context only when they have at-the-money stock options, but not when they have in-the-money stock options. Further, we find that managers in the loss context are less risk-taking with in-the-money stock options than with at-the-money stock options. This result suggests that as managers have greater wealth at stake and therefore bear greater risks, they become less risk-taking, especially in the loss decision context. Overall, our results suggest that neither agency theory nor prospect theory alone explain manager's risk-taking behavior. Rather, our results are consistent with the behavioral agency model, which considers the interaction between the problem frame and risk-bearing in stock option compensation in describing managerial risk-taking behavior.

Our study contributes to the extant literature in important ways. First, our study complements prior archival work on risk-taking and stock-based compensation schemes that are hampered by the endogenous nature of compensation contracts and investment decisions (e.g., [Larcker 1983](#); [Holthausen et al. 1995](#); [Devers et al. 2008](#)). Our experimental approach allows us to disentangle the effect of the incentive scheme from the effects caused by selection issues ([Rajgopal and Shevlin 2002](#)), to not rely on the viability of normative models to measure stock option value ([Devers et al. 2007a](#)) and to draw inferences beyond specific choice set contexts such as mergers and acquisitions ([Datta et al. 2001](#)), hedging activities ([Knopf et al. 2002](#)), R&D investments, business diversification, and financial policy ([Coles et al. 2006](#)), or specific industries such as gold mining ([Tufano 1996](#)) or oil and gas ([Rajgopal and Shevlin 2002](#)).

Second, this paper supplements prior experimental work identifying other decision-relevant factors that essentially reverse prospect theory-based predictions (e.g., [Sullivan and Kida 1995](#); [Moreno et al. 2002](#)). We thereby directly respond to calls for research examining the influence of compensation on proximal risk-taking behavior ([Devers et al. 2007a](#)). We empirically test important components of [Wiseman and Gomez-Mejia's \(1998\)](#) behavioral agency model and thereby provide explanations for inconsistencies found in prior literature that solely consider agency or prospect theory. In effect, we respond directly to [Eisenhardt's \(1989, 57\)](#) call for research that "incorporates an agency perspective ... [into] complementary perspectives."

In the next section, we discuss the behavioral agency model and develop the hypotheses. We then present the research method and results, followed by a discussion of the limitations and opportunities for future research.

BACKGROUND AND HYPOTHESES

The behavioral agency model incorporates key elements from agency and prospect theories to advance our understanding of managerial risk-taking behavior. In this section, we present the behavioral agency model, which then motivates our hypotheses. Key terms are defined in Table 1.

³ In particular, [Moreno et al. \(2002\)](#) find that managers reject (accept) investment alternatives that elicit negative (positive) affect, resulting in more (less) risk-taking in the gain (loss) context. This result is in direct contrast to the standard prospect theory-based predictions of less (more) risk-taking in the gain (loss) context.

TABLE 1
Definition of Key Terms

Asymmetric risk	Gain when transacting an underlying asset is significantly different from losses when transacting that underlying asset
At-the-money options	An option when the exercise price is equal to the prevailing stock price
Earnings per share	A company's earnings (net income) divided by the number of shares held by stockholders
Exercise an option	When an option holder purchases the underlying asset at the predetermined (exercise) price
Exercise price	A predetermined price at which an option holder may purchase an underlying asset
Instant endowment	Immediate inclusion of a future asset into perceptions of current wealth
In-the-money options	An option where the exercise price is less than the prevailing stock price
Loss aversion	A preference for options avoiding losses over options that limit the size of the loss
Recontracting options	Lowering the exercise price or canceling and then issuing new, replacement options
Risk-averse	A preference for lower risk options at the expense of returns
Risk-bearing	Perceived threats to current wealth
Risk-taking	Choosing higher risk projects over lower risk projects
Stock option	An option to purchase a share of the employer's stock for a predetermined (exercise) price within a specified time period

Behavioral Agency Model

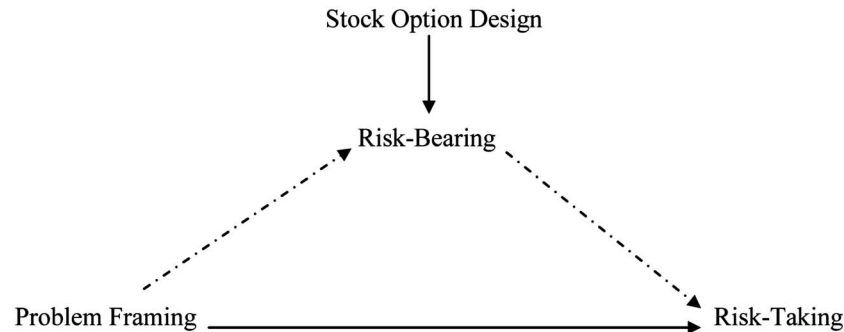
The behavioral agency model considers prospect theory within an agency framework as a way to better describe managerial risk-taking behavior. This model predicts that problem framing, instant endowment, risk-bearing, and monitoring intensity together impact managerial risk-taking behavior. This study focuses on the first three elements as depicted in Figure 1.⁴

The behavioral agency model draws from prospect theory, which suggests that agents frame problems by comparing potential outcomes (of various alternatives) relative to a reference point. A positive (negative) problem frame occurs when alternatives of varying risks and positive (negative) returns result in positive (negative) expected values for the firm. Problems can thus be framed as a "gain" or "loss" decision context. While gain contexts are likely more common in practice, loss contexts are nonetheless important.⁵ Problem framing effects arise when agents are loss

⁴ The full behavioral agency model from Wiseman and Gomez-Mejia (1998) is a larger model of risk-taking which includes additional variables (internal/external performance indicators, performance history, direct supervision, target difficulty, compensation mix, behavioral evaluation criteria, problem framing, and stock option design). Our model focuses on a subsection of this model (problem framing and stock option design). The portion we do not examine, monitoring intensity, suggests 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 increases managerial risk-bearing, which in turn induces less risk-seeking behavior. Wright et al. (1996) examine several dimensions of firm-level monitoring that impact firm risk-taking behavior. We focus on one manager-level factor (i.e., greater risk-bearing arising from endowed stock option compensation) and control for the monitoring system and other firm-level attributes such as overall firm risk by providing one common firm context in our experimental design, which is explained further in the next section.

⁵ Examples of the latter would be when a company is considering alternative ways to comply with pollution control requirements, meeting new quality control standards (e.g., preventing the import of lead paint toys or sale of tainted beef), or making an initial investment for strategic reasons to enter a market (e.g., a "loss leader").

FIGURE 1
A Depiction of Elements in the Behavioral Agency Model Stock Option Design



The solid lines indicate direct effects on risk-bearing and risk-taking.

The dotted lines indicate an interaction between problem framing and risk-bearing on risk-taking.

averse, that is, preferring options that avoid losses altogether over options that limit the size of the loss.⁶ This preference for avoiding losses stems from individuals being more sensitive to losing wealth than gaining wealth (Tversky and Kahneman 1986, 1991). As a result, risk preferences of individuals (and thus risk-taking behavior) will change with the problem frame such that loss-averse agents will be less risk-taking in a gain decision context but more risk-taking in a loss decision context (Kahneman and Tversky 1979).

In addition to the problem framing effect, the behavioral agency model draws on the idea of instant endowment as a second element explaining managerial risk-taking behavior. The instant endowment assumption indicates that agents include just received or fully anticipated wealth into their calculations of personal wealth (Thaler and Johnson 1990). Wiseman and Gomez-Mejia (1998) suggest that both future base pay and future stock-based pay that are previously awarded, but not exercised, become part of an agent's perceived wealth. First, agents perceive future base pay (i.e., nonvariable pay) much like a renewable annuity and immediately include this amount into calculations of current personal wealth (Thaler 1980). This reasoning is consistent with banks considering the promise of future pay into their calculations of how much to approve for individuals applying for a loan. Second, agents instantly endow the value of stock options and include this in current wealth. This reasoning is consistent with banks accepting unexercised stock options as collateral to secure loans (Scannell 2001).

The third element in the behavioral agency model, namely risk-bearing, focuses on how the instant endowment of stock option pay influences risk-taking behavior. Wiseman and Gomez-Mejia (1998) define risk-bearing as the perceived risk to the agent that can result from employ-

⁶ Note that the loss-aversion assumption under prospect theory differs from the risk-aversion assumption under agency theory. While both the positive and normative agency literatures assume that agents are risk averse and that their risk preferences are stable across decision contexts, the behavioral agency model relaxes this assumption and suggests that an agent's risk preferences will change across decision contexts.

ment risk or other threats to agent wealth.⁷ They argue that in the presence of risk-bearing, agents will be less likely to choose risky projects if they perceive the choice might jeopardize their current wealth. Further, Wiseman and Gomez-Mejia (1998) propose that unexercised, positive-valued stock options (in-the-money) create risk-bearing for the agent. But, that when the downside risk of stock options are set to zero (at-the-money), stock options do not create risk-bearing. This view is consistent with Guay (1999), who finds that stock options increase the sensitivity of the CEOs' wealth to equity risk. When taken together with instant endowment, the greater the value of stock options, the greater the current wealth at stake and the greater the risk-bearing, thereby inducing managers to be less risk-taking. Thus, in-the-money stock options (instantly endowed, positively valued stock options) increase risk-bearing and, as a result, agents would have a preference for projects that will potentially protect their wealth (i.e., less risky) because now they have more wealth to lose.⁸

Hypotheses

To summarize, first the behavioral agency model argues that problem framing reduces risk-taking behavior in the gain decision context relative to the loss decision context. In this case, the decision context is determined to be a gain (loss) if the alternatives in a set of project choices that result in a positive (negative) change in a firm's profits. The influence of problem framing on risk-taking is represented by a solid line in Figure 1. Second, managers instantly endow the value of stock option compensation and include this in current wealth. Third, risk-bearing results from threats to instantly endowed compensation (including stock based compensation) and anticipated adjustments to that compensation. If compensation is insulated from possible losses, as in the case of at-the-money stock options, then the manager will perceive low risk-bearing. However, if compensation is subject to potential losses, as in the case of in-the-money stock options, then the higher the wealth at stake, the greater the manager's risk-bearing. In other words, from the manager's perspective, there is now more wealth at stake (Ross 2004). The influence of stock option design on risk-bearing is represented by a solid line in Figure 1.

Finally, the behavioral agency model argues that greater risk-bearing will moderate the influence of problem framing on risk-taking behavior. Said another way, the greater risk-bearing in the form of in-the-money stock options will reduce the influence of problem framing on risk-taking behavior.⁹ This interaction is represented by a dotted line from problem framing to risk-bearing and then from risk-bearing to risk-taking in Figure 1. We therefore expect that managers with

⁷ Larraza-Kintana et al. (2008) also uses the behavioral agency model framework but focuses on the impact of managerial employment risk on risk-taking behavior. We focus on arguably a more immediate and likely first order factor, namely greater risk-bearing arising from endowed stock option compensation.

⁸ Of importance is that this implication of risk-bearing is in contrast to that in agency theory. Agency theory defines risk-bearing in the context of shifting risk from the principal to the agent by placing more of the agent's compensation at risk (Wiseman and Gomez-Mejia, 1998), resulting in more risk-taking on the part of the agent. An example of greater risk-bearing under agency theory would be increasing the proportion of the agent's compensation that is tied to firm performance (e.g., through new stock option grants). Agency theorists argue that principals do this to align the agent's incentives with their own. Because the agent is now more of an owner, she has greater incentives to take on risky projects that increase the firm value and in the process, her own wealth (Larcker 1983). In contrast, the behavioral agency model argues that because agents instantly endow unexercised, in-the-money options, they perceive greater risks to current wealth, which in turn reduces the preference for taking risky bets. This argument is similar to the view that an agent's wealth portfolio holdings influence risk-taking behavior (e.g., Carpenter 2000, Ross 2004), and is consistent with the conjecture that in-the-money stock options may be subject to the downside potential of outcome variance but at-the-money stock options are not (Wright et al. 1996).

⁹ These predictions are consistent with Wiseman and Gomez-Mejia's (1998) proposition 1: To the degree that executive wealth is tied to firm performance, risk-bearing moderates the influence of problem framing on risk-taking behavior; proposition 5a: Unexercised, positively valued stock options create risk-bearing for the agent, which ultimately increases executive risk aversion; and proposition 5b: Stock options do not create risk-bearing for the agent when the downside risk of stock options is set to zero.

at-the-money stock options would have a greater response to problem framing (i.e., more risk-taking in the loss context than in the gain context) than managers with in-the-money stock options. In addition, since problem-framing effects increase (decrease) risk-taking in the loss (gain) context, we expect that the moderating effect of greater risk-bearing in stock option compensation (i.e., moving from at-the-money options to in-the-money options) will be more pronounced in the loss context than in the gain context. We thus predict an interaction between risk-bearing in the form of stock based-compensation (at-the-money, in-the-money) and problem framing (gain, loss), as reflected in the following hypothesis.

H1: Risk-bearing in the form of stock based compensation will moderate the influence of problem framing on risk-taking behavior (i.e., problem framing and risk-bearing will interact).

More specifically:

H1a: More managers with at-the-money stock options will respond to problem framing effects (i.e., greater risk-taking in the loss context than in the gain context) than managers with in-the-money stock options.

H1b: The difference in risk-taking behavior between managers with at-the-money stock options and managers with in-the-money stock options in the loss context will be greater than in the gain context.

METHOD

Sample

The participants in the experiment are M.B.A. students at various midsize east and west coast universities who volunteered to be part of the study. M.B.A. students are considered good surrogates for managers in the experimental task since the task (described below) is a straightforward choice and does not require intricate, in-depth task knowledge beyond what M.B.A. students are likely familiar with given their work and academic experiences (Libby et al. 2002; Elliott et al. 2007). Out of a total of 110 participants, 108 completed all of the necessary parts of the task. Demographic data on the participants indicates that they have an average of six years of work experience. Untabulated results further indicate that 86 percent (78 percent) have enrolled in one or more accounting (finance) courses, and 78 percent have exposure in prior classes with the topic of investment choice decisions (the focus of the case). Of some concern, only 27 percent have received some form of stock options in the past. However, as discussed later, experience with stock option compensation was not found to be a significant covariate in any of the analyses. Chi-square and t-tests reveal no significant differences ($p \leq .10$) in demographic characteristics between the experimental conditions.

Design

The experiment entails a 2×2 between-subjects design where the independent variable is problem frame (gain or loss). The moderating variable is risk-bearing in stock-based compensation (low, high). In the experimental materials, participants are asked to choose between two capital budgeting alternatives. In the gain context, participants choose between two projects that contain varying levels of risk (more risky, less risky), which both would result in a gain for the firm. In the loss context, participants choose between two projects that contain varying levels of risk, which would both result in a loss for the firm.

The moderating variable, risk-bearing, was operationalized as the level of stock option compensation (at-the-money stock options or in-the-money stock options).¹⁰ The level of stock option compensation represented the amount of wealth at stake. At-the-money stock options represent less wealth at stake while in-the-money stock options represent more wealth at stake. For example, under the at-the-money stock option condition in the gain and loss contexts, the current stock price of \$10 is equal to the exercise price and hence the potential initial wealth is zero $[(\$10 - 10) \times 100,000 \text{ stock options}]$.¹¹ For the in-the-money stock option conditions in the gain and loss contexts, the current stock price is \$11 so that the initial wealth is \$100,000 $[(\$11 - 10) \times 100,000 \text{ stock options}]$.¹² The experimental materials describe a base salary in addition to the level of stock option compensation in effect.¹³ The stock option compensation is described as fully vested and about to expire.¹⁴

Task

Participants are asked to evaluate two proposed capital budgeting projects for their firm: a choice between a riskless project and a risky project. The projects are the same in all other dimensions except for the amounts and probabilities associated with each.¹⁵ In the gain context, the choice is between a sure project gain of \$2,400,000 and an expected project gain of \$2,500,000 (25 percent chance of a \$10,000,000 gain and 75 percent chance of zero gain), while in the loss context, the choice is between a sure project loss of \$7,400,000 and an expected project loss of \$7,500,000 (75 percent chance of a \$10,000,000 loss and 25 percent chance of zero loss).^{16,17}

¹⁰ In the experiment we also included restricted stock as a stock-based compensation with both gain and loss conditions. Restricted stock is not a focus of this study but is related to another study comparing stock options and restricted stock.

¹¹ In addition, to make salient that there is zero wealth at stake for the at-the-money stock option conditions and hence full downside loss protection, we explain that there is a recontracting provision guaranteeing that should the prevailing stock price fall below the exercise price, the exercise price will be reduced to equal the prevailing stock price. This is an important design choice to meet the definition of Wiseman and Gomez-Mejia's (1998) proposition 5 that a stock option with downside risk set to zero will not create risk-bearing.

¹² 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. However, we explore whether hedging is a possible explanation for risk-seeking behavior through the content analysis discussed in a later section.

¹³ Although we explicitly mention the provision of a base salary in the experimental materials, we do not state the amount of the base salary. On one hand, a base salary level perceived as high by the participant may unduly induce the participant to not change risk-taking behavior despite greater risk-bearing in stock option pay. On the other hand, a base salary level perceived as low by the participant may artificially heighten sensitivity to risk arising from stock option pay. Because it is an open empirical question how individuals perceive stock-based compensation when complemented with a specified level of base salary, we made this design choice to reduce the undue influence of an arbitrary level of salary on our results.

¹⁴ Stock options are defined as fully vested because the relevant behavioral agency model propositions specifically relate to unexercised (exercisable) stock options (Wiseman and Gomez-Mejia 1998). Setting the stock-based compensation as vested and close to expiration allows us to control for significant uncertainties about how individuals value stock options (Hodge et al. 2007) that would likely result in wide variance in beliefs. The choice of a single period rather than a multiperiod setting is an important design feature because it makes salient the clear, singular, and immediate link between the manager's project choice and the consequent effect in EPS, stock price, and hence their stock-based compensation. This design thus isolates the proximal effect of greater risk-bearing on project choice.

¹⁵ A truly riskless choice may be based on the certainty effect and participants may place more value on a riskless outcome. This potential limitation would, thus, create a uniform effect that would bias against our predicted results.

¹⁶ The amounts and probabilities are adapted from classic framing problems (Tversky and Kahneman 1981, 1986). For example, Tversky and Kahneman's experiment asked participants to choose between: A, a sure gain of \$240 and B, 25 percent chance to gain \$10,000 and 75 percent chance to gain nothing. In the second choice set, they asked participants to choose between: C, a sure loss of \$750 and D, 75 percent chance to lose \$1,000 and 25 percent chance to lose nothing. We choose to replicate their amounts and probabilities because of the robust results supporting the influence of problem framing. In that way we limit the potential for our results being related to choice of amounts and probabilities instead of risk-bearing.

¹⁷ The loss condition is framed as "critically important to your company's overall strategic 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

If managers were to make decisions solely based on comparing expected values, 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 problem framing effect predicted in the behavioral agency model is expected to result in the relative attractiveness of the sure gain over the risky choice in the gain context (i.e., Project A), and the relative attractiveness of the risky choice over the sure loss in the loss context (i.e., Project B). Therefore, our design provides a strong test for the behavioral agency model-based hypotheses in potentially biasing against the investment choices predicted by the model.

To avoid potential biases due to perceived industry effects (e.g., high-tech firms) or firm characteristics (e.g., size, risk), 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. In addition, we did not include monitoring intensity, which is part of the Wiseman and Gomez-Mejia model, as part of this study. Because monitoring intensity is typically an explicit supervisory action or expectation, the experimental materials were silent on any reference to a supervisor, supervisory expectations, or managerial performance measures.

Because stock options are supposed to provide incentive for managers to take firm value-increasing actions, we felt it was important to establish a link between the manager’s choice and the ultimate impact on firm performance and then on stock option compensation. The desired link then is:

Manager ’ s choice → Firm profitability → Stock Price
→ Manager ’ s stock option compensation.

This link is made salient in the experiment by indicating that the investment choice is material and directly impacts the firm’s income and earnings per share (EPS), which has been strongly tied in the past to stock price. In addition, we provided information to the participants that estimate the impact of the two choices (Project A or B) on EPS, stock price, and as a result, the impact on the participant’s wealth. 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 78 percent of the participants expressed a strong belief (median of 70 out of 100) that the outcome of their project choice has a relatively direct impact on the firm’s stock price, suggesting they saw the intended effect. As discussed later, the response on this scale is also used as a covariate in additional logistical regression analyses.

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, 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 \$25.¹⁸ The minimum payment was intended to adequately compensate

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.

¹⁸ Pay levels have not been shown to provide different incentive effects. For example, [Evans et al. \(2001\)](#) examined managerial honesty using three experiments with three different levels of payoff (\$0 to \$33.33, \$0 to 66.67, \$0 to

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.¹⁹ 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 the random number is greater 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.

Manipulation Checks and Knowledge Questions

The experimental materials were separated into two parts: (1) the case, and (2) the manipulation check and knowledge questions. Participants were told to first choose between a risky and a riskless project and provide reasons for their choice, insert and seal the case in a large envelope, and then respond to manipulation checks and knowledge questions. The manipulations were successful with respect to the gain or loss context (88 percent correct) and the type of stock option compensation assigned (74 percent correct). In addition, participants were asked to answer two multiple-choice questions testing the participant's knowledge about the nature of the various stock option compensation schemes.²⁰ Ninety-three percent of participants correctly answered a multiple-choice question regarding at-the-money stock options. One of the possible responses in the multiple-choice question about at-the-money stock options described in-the-money stock options. None of the participants chose that response, indicating that the participants did not mistake at-the-money stock options for in-the-money stock options. Finally, 92 percent of participants correctly answered a multiple-choice question regarding at-the-money stock options with a recontracting agreement.²¹ In all, responses indicated participants generally understood the type of stock option compensation to which they were randomly assigned.

RESULTS

Our hypotheses predict that risk-bearing in the form of stock-based compensation moderates the effect of problem framing on risk-taking behavior. Specifically, managers with at-the-money stock options (low risk-bearing) will respond more to problem framing (i.e., greater risk-taking in the loss context than the gain context) than managers with in-the-money stock options (high risk-bearing). And, that the difference in risk-taking behavior between managers with at-the-

\$333.33). They found that the level of payoff did not influence the level of truthful reporting, i.e., \$333.33 was not 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.

¹⁹ 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.

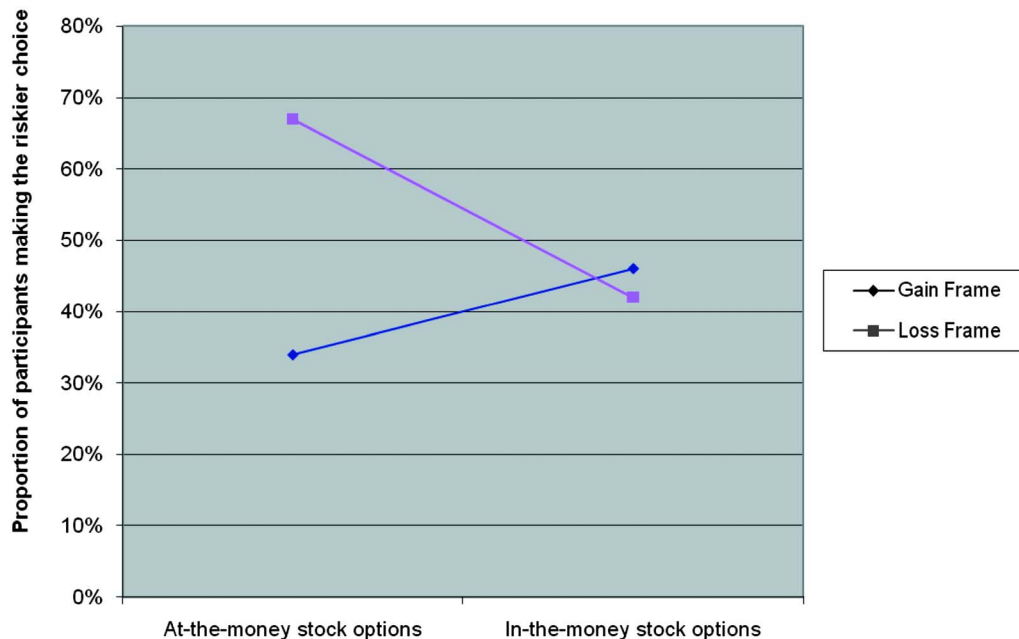
²⁰ A third multiple-choice question was asked regarding restricted stock, which is not relevant to this study.

²¹ We also tested the hypotheses excluding the participants with incorrect answers to the knowledge questions. The results were qualitatively similar to the results that included all participants. Therefore, all participants are included in the analyses presented.

money stock options and managers with in-the-money stock options will be greater in the loss context than the gain context. Figure 2 presents the percentage of participants with stock options (at-the-money, in-the-money) that chose Project B (risky choice). First, based on the visual presentation, it appears that problem framing and risk-taking interact as predicted.

According to Baron and Kenny (1986), to test for a moderator, the moderator hypothesis is supported if the interaction of the predictor variable (problem framing) and the moderator variable (risk-bearing) is significant. Further, there may also be significant main effects for the predictor and the moderator variables, but these are not directly relevant conceptually. Table 2 presents the percentage of participants who chose Project B (risky choice) in each of the stock option conditions in Panel A, and the results of a logit analysis are reported in Panel B. We examine the interaction term (*Context * Compensation*) and find that greater risk-bearing reduces the influence of problem framing ($p = 0.028$), providing support for H1. The results support the behavioral agency model predictions that risk-bearing moderates the influence of problem framing on risk-taking behavior. In addition, problem framing is significant ($p = 0.009$) but the main effect for risk-bearing is not ($p = 0.1795$). Further, because risk-bearing moderates the influence of problem framing, we expect that problem-framing will have a greater influence when there is low risk-bearing (at-the-money stock options), but not when there is high risk-bearing (in-the-money stock options). We see that in Figure 2, more participants with at-the-money stock options were risk-

FIGURE 2
Project Choice by Problem Frame and Level of Risk-Bearing



See Table 2 for a complete report of the number and percent of participants choosing Project B (more risk-taking).

TABLE 2
Behavioral Agency Model Predictions:
Project Choice and Test of Risk-Taking Behavior

Panel A: Percent of Participants Choosing Project B (more risk-taking)

Compensation/Context	At-the-Money Stock Options (n = 54)	In-the-Money Stock Options (n = 51)	All Contexts (n = 105)
Gain (n = 57)	34% (n = 29)	46% (n = 28)	40% (n = 57)
Loss (n = 51)	67% (n = 27)	42% (n = 24)	55% (n = 51)
Total (n = 108)	50% (n = 56)	44% (n = 52)	

Panel B: Logit Tests of Hypotheses (At-the-Money Stock Options versus In-the-Money Stock Options)

$$Project\ choice = \alpha_0 + \beta_1 Context + \beta_2 Compensation + \beta_3 Context * Compensation + error$$

Variables	Coefficient	p-value
Intercept	-0.642	0.050
Context (Problem Frame)	1.335	0.009
Compensation (Risk-Bearing)	0.499	0.1795
Context * Compensation (H1)	-1.528	0.028
n		108
Nagelkerke R ²		0.077

Project choice is coded 1(0) for participants choosing Project B (more risky choice) or 0 for Project A (less risky choice). Compensation is coded 1(0) for participants with in-the-money stock options (at-the-money stock options). Context is coded 1(0) for participants in the loss (gain) context.

taking in the loss condition than in the gain condition. Further, we examined the participants with at-the-money stock options separately from participants with in-the-money stock options. Based on logit analysis (untabulated) we find that in the at-the-money condition (low risk-bearing), more participants choose Project B in the loss condition (67 percent) than in the gain condition (34 percent) indicating that they responded to problem framing ($p = 0.0009$). Further, in the in-the-money condition (high risk-bearing), only 42 percent of the participants chose Project B in the loss condition and 46 percent in the gain condition, indicating that they did not respond to problem framing ($p = 0.412$).

Finally, we expect that risk-bearing will have less of an influence on risk-taking behavior in the gain context than the loss context. As seen in Figure 2, there is a larger difference in risk-taking behavior between participants with at-the-money stock options and participants with in-the-money stock options in the loss condition than there is in the gain condition. Further, the results of a logit regression (untabulated) indicate that in the loss condition, participants with at-the-money stock options were significantly more risk-taking than participants with in-the-money stock options ($p = 0.0385$). Conversely, in the gain condition participants with at-the-money stock options were less risk-taking than participants with in-the-money stock options but this difference was not significant ($p = 0.1795$).

Overall, we find that the problem framing effect does not solely describe managerial risk-taking behavior. However, when we consider the behavioral agency model propositions, we find evidence consistent with problem framing and risk-bearing together impacting managerial risk-taking behavior. Specifically, loss-averse managers endowed with stock option compensation are more (less) risk-taking in the loss (gain) context when endowed with at-the-money stock options (lower risk-bearing), but not when endowed with in-the-money stock options (greater risk-bearing). In essence, risk-bearing reduces the influence of problem framing on risk-taking behavior. Finally, we find that the reduction in risk-taking behavior is strongest in the loss context.

Additional Analysis

To consider important potential alternative explanations for our findings we asked participants to briefly provide the reason(s) for their project choice. Two of the researchers and two coders individually examined ten 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” were eventually determined to most accurately and completely capture participants’ responses. The final level of inter-coder agreement was 84 percent, demonstrating a high level of coding reliability.

An alternative explanation for our results is based on agency theory, which assumes that managers focus attention on the expected value ordering of projects. On this basis, we would expect participants to report expected value as the predominant reason for the project choice. Looking at all decision contexts combined, participants with in-the-money stock options reported expected value (37 percent) more often than risk avoidance (32 percent) or loss avoidance (24 percent). In contrast, participants with at-the-money stock options cite risk avoidance more often (45 percent) than expected value (27 percent) or loss avoidance (22 percent). These results suggest that agency theory predictions focused on expected value alone do not consistently explain managerial risk-taking behavior in our experiment.

Consequently, another alternative explanation for this result is based on prospect theory, which argues that loss-averse managers are more risk-taking when in a loss context compared to a gain context. Looking at all stock option compensation conditions combined, the majority of participants in the gain context note risk avoidance more often (59 percent) while participants in the loss context identify loss avoidance most often as the reason for their project choices (50

percent). The loss-aversion effect is thus more apparent in the loss context than in the gain context. These results suggest that prospect theory predictions based on the decision context alone do not consistently explain managerial risk-taking behavior in our experiment. Taken together, the content analyses are consistent with the view that neither agency theory-based nor prospect theory-based predictions alone consistently explain managerial risk-taking behavior (Shimizu 2007).

DISCUSSION

The behavioral agency model of managerial risk-taking behavior relaxes key assumptions underlying both agency and prospect theories. Rather than the stable risk preference assumption in agency theory, the behavioral agency model assumes that risk-taking behavior depends on the decision context (i.e., problem frame: gain or loss). Further, the behavioral agency model suggests that the individual's endowed wealth in stock option compensation influences perceived wealth at stake (i.e., risk-bearing), and consequently, influences managerial risk-taking behavior. Hence, prospect theory predictions are altered when considered within an agency framework. Consistent with the behavioral agency model, we find evidence that problem framing and risk-bearing in stock option compensation together impact managerial risk-taking behavior. This finding, thus, deepens our overall understanding of managers' decision-making process.

First, we find that stock options of greater value (in-the-money versus at-the money) induce less risk-taking behavior, particularly in a loss context. This result is consistent with theoretical research (e.g., Carpenter 2000; Ross 2004) proposing that increasing wealth reduces managerial risk-taking behavior. The risk-bearing effect then effectively moderates the problem framing effect in the loss context (e.g., Devers et al. 2007). Our study thus adds to the line of research that identifies other decision-relevant factors that refine prospect theory predictions in explaining managerial risk-taking behavior (e.g., Moreno et al. 2002). Our findings also have important practical implications. Specifically, when choosing among potential loss projects in periods of economic downturns, increasing wealth at stake results in less risk-taking behavior.²² Therefore, increasing value in stock options may reduce a manager's incentive to engage in risky project choices, which may be contrary to shareholder interests.

Finally, our study has broad implications for those designing and using incentive compensation systems. Our results provide a potential explanation for why firms continue to grant at-the-money stock options despite the firm facing financial losses as a way to shield managers from potential losses in personal wealth and, as a result, inducing managers to accept risky but firm-value-increasing projects. In addition, our results suggest that changes to compensation impact risk-taking behavior. For example, 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. 2007) may also result in changes in managerial risk-taking behavior (Devers et al. 2007). A deep understanding of the effects of different economic contexts on managerial risk-taking behavior thus continues to be imperative. In the end, we find that the use of stock options does not ensure that the incentives of managers will be consistently aligned with those of shareholders.

Some potential limitations should be considered in interpreting our findings. Relatively few of our participants have actually received stock option compensation (27 percent). While these ex-

²² We do not make conclusions about whether a reduction in risk-taking behavior in the loss context is better or worse for a company. For example, if a company wants managers to be more risk-taking in general, a reduction in risk-taking behavior would be undesirable. If, however, a company wants managers to choose projects with the highest expected value regardless of risk, then, in our example, a company would want managers to choose Project A (less risky), in which case a reduction in risk-taking would be desirable. This is case specific, however. As a result, a change in risk-taking behavior could be better or worse for a company depending on the specific choice set. The focus of our study is to show that while stock options are intended to increase managerial risk-taking, we find that other factors, such as problem framing and risk-bearing, interact together to influence managerial risk-taking.

posure levels are consistent with other published studies (e.g., [Devers et al. 2007](#)), it is not known whether additional exposure may affect the findings. In addition, our experimental materials present participants with a single grant of stock options, which were fully vested and about to expire. This was a critical design choice to emphasize the connection between the current investment outcome, change in earnings per share, stock price, and participant's immediate change in wealth. Further, we include an unspecified base pay in the experimental materials to increase external validity. In so doing, however, we ran the risk that the unspecified base pay could potentially influence participant's risk-taking behavior. We evaluated participants' comments in an attempt to rule out this concern. While only two participants mentioned salary in their comments, we cannot completely rule out the possibility that salary was not a primary factor in participant's choice. Addressing each of these limitations represents rich avenues for future research.

Ultimately, explaining the role of stock-based compensation in managerial risk-taking behavior is complex. We encourage future research to examine other important compensation characteristics and contextual variables that could influence managerial risk-taking behavior. This includes, but is not limited to examining unexercisable (unvested) grants of stock options and restricted stock, multiple stock option grants, and a mix of stock option and restricted stock grants. Also important would be to examine the impact of other monitoring mechanisms, since their intensity likely plays a role in predicting managerial risk-taking behavior ([Wiseman and Gomez-Mejia 1998](#)).

REFERENCES

- Baron, R. M., and D. A. Kenny. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* 51 (6): 1173–1182.
- Becker, B. 2006. Wealth and executive compensation. *The Journal of Finance* 61 (1): 379–397.
- Carpenter, J. 2000. Does option compensation increase managerial risk appetite? *The Journal of Finance* 55: 2311–2331.
- Carter, M. E., L. Lynch, and I. Tuna. 2007. The role of accounting in the design of CEO equity compensation. *The Accounting Review* 82 (2): 327–357.
- Christian, C., and S. Gupta. 1994. The relation between the use of tax preparer's and tax payers' prepayment position. *The Journal of the American Taxation Association* 16: 74–93.
- Cohen, J. R., and G. M. Trompeter. 1998. An examination of factors affecting audit practice development. *Contemporary Accounting Research* 15 (4): 481–505.
- Coles, J. L., N. D. Daniel, and L. Naveen. 2006. Executive compensation and managerial risk-taking. *Journal of Financial Economics* 79 (2): 431–468.
- Datta, S., M. Iskandar-Datta, and K. Raman. 2001. Executive compensation and corporate acquisition decisions. *The Journal of Finance* 56 (6): 2299–2336.
- Devers, C. E., A. A. Cannella, G. P. Reilly, and M. E. Yoder. 2007a. Executive compensation: A multidisciplinary review of recent developments. *Journal of Management* (33): 1016–1072.
- , R. M. Wiseman, and R. Michael Holmes Jr. 2007. The effects of endowment and loss aversion in managerial stock option valuation. *Academy of Management Journal* 50 (1).
- , G. McNamara, R. M. Wiseman, and M. Arrfelt. 2008. Moving closer to the action: examining compensation design effects on firm risk. *Organization Science* 19 (4): 548–566.
- Eisenhardt, K. M. 1989. Agency theory: An assessment and review. *Academy of Management Review* 14 (1): 57–74.
- Elliott, W. B., F. Hodge, J. Kennedy, and M. Pronk. 2007. Are M.B.A students a good proxy for nonprofessional investors? *The Accounting Review* 82 (1): 139–168.
- Evans, J. H., R. L. Hannan, R. Krishnan, and D. Moser. 2001. Honesty in managerial reporting. *The Accounting Review* 76: 537–559.
- Fagley, N. S., and P. M. Miller. 1987. The effects on decision framing on choice of risky vs. certain options.

- Organizational Behavior and Human Decision Processes* 39: 264–277.
- Guay, W. R. 1999. The sensitivity of CEO wealth to equity risk: An analysis of the magnitude and determinants. *Journal of Financial Economics* 53 (1): 43–71.
- Hall, B. J. 2003. Six challenges in designing equity-based pay. *Journal of Applied Corporate Finance* 15: 21–33.
- , and K. J. Murphy. 2003. The trouble with stock options. Working paper, Harvard University.
- , and J. B. Liebman. 1998. Are CEOs really paid like bureaucrats? *The Quarterly Journal of Economics* 113 (3): 653–691.
- Hemmer, T., O. Kim, and R. E. Verrecchia. 1999. Introducing convexity into optimal compensation contracts. *Journal of Accounting and Economics* 28 (3): 307–327.
- Hodge, F., S. Rajgopal, and T. Shevlin. 2007. How do managers value stock options and restricted stock? Working paper, University of Washington.
- Holthausen, R., D. Larcker, and R. Sloan. 1995. Business unit innovation and the structure of executive compensation. *Journal of Accounting and Economics* 19: 279–313.
- Jensen, M. C., and W. H. Meckling. 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3: 305–360.
- Kahneman, D., and A. Tversky. 1979. Prospect theory: An analysis of decisions under risk. *Econometrica* 47: 262–291.
- Kinney, W. R. 2001. Accounting scholarship: What is uniquely ours? *The Accounting Review* 76 (2): 275–284.
- Knopf, J. D., J. Nam, and J. H. Thornton, Jr. 2002. The volatility and price sensitivities of stock option portfolios and corporate hedging. *The Journal of Finance* 57: 801–813.
- Larcker, D. F. 1983. The association between performance plan adoption and corporate capital investment. *Journal of Accounting and Economics* 5 (1): 3–30.
- Larrazza-Kintana, M., R. M. Wiseman, L. R. Gomez-Mejia, and T. M. Welbourne. 2008. Disentangling compensation and employment risks using the behavioral agency model. *Strategic Management Journal* 28 (10).
- Libby, R., R. Bloomfield, and M. W. Nelson. 2002. Experimental research in financial accounting. *Accounting, Organizations and Society* 27 (8).
- Lipe, M. 1993. Analyzing the variance investigation decision: The effects of outcomes, mental accounting, and framing. *The Accounting Review* 68: 748–764.
- Milgrom, P., and J. Roberts. 1992. *Economics, Organization and Management*. New York, NY: Prentice Hall.
- Moreno, K., T. Kida, and J. F. Smith. 2002. The impact of affective reactions on risky decision making in accounting contexts. *Journal of Accounting Research* 40 (5): 1331–1349.
- Murphy, K. J. 1999. Executive Compensation. In *Handbook of Labor Economics*, edited by Ashenfelter, O., and D. Card., Vol. 3. Amsterdam, The Netherlands: North-Holland.
- Palmer, T. B., and R. M. Wiseman. 1999. Decoupling risk taking from income stream uncertainty: A holistic model of risk. *Strategic Management Journal* 20: 1037–1062.
- Parrino, R., A. M. Potoshman, and M. S. Weisbach. 2005. Measuring investment distortions when risk-averse managers decide whether to undertake risk projects. *Financial Management* 34 (1): 21–60.
- Rajgopal, S., and T. Shevlin. 2002. Empirical evidence on the relation between stock option compensation and risk taking. *Journal of Accounting and Economics* 33: 145–171.
- Ross, S. 2004. Compensation, incentives, and the duality of risk aversion and riskiness. *The Journal of Finance*: 207–225.
- Scannell, K. 2001. Deals and deal makers: Fund to aid in exercise of options. *Wall Street Journal* (March 31): C16.
- Shepanski, A., and D. Kelsey. 1990. Testing for framing effects in taxpayer compliance decisions. *The Journal of the American Taxation Association* 12: 60–77.
- Shimizu, K. 2007. Prospect theory, behavioral theory, and threat-rigidity thesis: Combination effects on organizational divestiture decisions of a formerly acquired unit. *Academy of Management* 50 (6).
- Smith, C., and R. Stulz. 1985. The determinants of firms' hedging policies. *Journal of Financial and Quantitative Analysis* 20: 391–405.
- Sullivan, K., and T. Kida. 1995. The effect of multiple reference points and prior gains and losses on

- managers' risky decision making. *Organizational Behavior and Human Decision Processes* 64 (1): 76–83.
- Thaler, R. 1980. Toward a positive theory of consumer choice. *Journal of Economic Behavior & Organization* 1: 39–60.
- , and E. J. Johnson. 1990. Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice. *Management Science* 36 (6): 643–660.
- Tufano, P. 1996. Who managers risk? An empirical examination of risk management practices in the gold mining industry. *The Journal of Finance* 51: 1097–1137.
- Tversky, A., and D. Kahneman. 1981. The framing of decisions and the psychology of choice. *Science New Series* 211 (4481): 453–458.
- , and ———. 1986. Rational choice and the framing of decisions. *The Journal of Business* 59 (4): S251–S278.
- , and ———. 1991. Loss aversion in riskless choice: A reference dependent model. *The Quarterly Journal of Economics* 107: 1039–1061.
- Wang, X. T. 1996. Framing effects: Dynamics and task domains. *Organizational Behavior and Human Decision Processes* 68: 145–157.
- Wiseman, R. M., and L. R. Gomez-Mejia. 1998. A behavioral agency model of managerial risk taking. *Academy of Management Review* 23 (1): 133–153.
- Wright, P., S. P. Ferris, A. Sarin, and V. Awasthi. 1996. Impact of corporate insider, blockholder, and institutional equity ownership on firm risk taking. *Academy of Management Journal* 39 (2): 441–463.

Copyright of Behavioral Research in Accounting is the property of American Accounting Association and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.