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Prospect Theory Predictions When Escalation Is Not the Only Chance to Recover Sunk Costs

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Two experiments tested the effect of risk of alternative investment opportunities on decision behavior in an escalation context. In the first experiment (n = 170), the risk of the reinvestment option, which had been unsuccessful and incurred a sunk cost, was held equal to that of an alternative investment project. Responsibility for the previous decision was manipulated between these subjects. Subjects were required to choose between the reinvestment option and the alternative. Responsible subjects demonstrated classic reinvestment (escalation) tendencies, and nonresponsible subjects exhibited a significant tendency to avoid reinvestment. Subjects in the second experiment (n = 195) completed the same decision task and were also assigned to high and low responsibility conditions. In this experiment the risk of investing further in a previously chosen project, relative to the risk of the alternative project, was manipulated. Those subjects who were responsible for the first decision (a) demonstrated no preference for or against continued pursuit of the initial project (i.e., there was no escalation tendency) and (b) preferred the less risky of the second investments, regardless of whether it was or was not the initially chosen project. Nonresponsible subjects showed no risk preference or proclivity for reinvestment. The results of these experiments suggest that salient information concerning relative risk dominates the effect of prior performance information when alternative investments are considered. We discuss the implications of these findings for decision theory and for methodology in commitment escalation research.

Investment choice decisions are imbedded in a rich context of past decisions, existing circumstances, and future projections. The escalation of commitment and entrapment literatures have shown that individuals' prior decisions have an effect on their future courses of action even when these have no objective bearing on the expected utility of alternative

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prospects (Arkes & Blumer, 1985; Brockner & Rubin, 1985; Staw, 1976). Researchers have recently incorporated aspects of the extant and the prospective situation to define the boundaries of this seemingly nonrational renewal of resource investments. For example, prevailing norms for consistency of action, competition, and publicity appear to heighten reinvestment in a previously chosen course of action (see Staw & Ross, 1987), whereas the presence of alternatives and salient information regarding the probabilities of future outcomes may reduce reinvestment (McCain, 1986).

In the conventional escalation context, individuals who are responsible for an initial investment decision that led to failure continue to reinvest in the same course of action. A range of alternative theories have been posited to predict and explain this escalation phenomenon (see reviews by Arkes & Blumer (1985) and Bazerman, Guiliano, & Appleman (1984)), but their dominant shared principle is the responsible decision maker's perceived demand to justify the prior decision, either to him- or herself as under a self-perception or a dissonance interpretation, or to others as under an external justification or a reactance interpretation.

Bazerman (1984) noted that Prospect Theory (Kahneman & Tversky, 1979) makes predictions about how the decision context affects risk orientations, and he suggested that this may explain the major commitment escalation findings in a different way than the existing psychological theories. Prospect Theory suggests a strong relationship between the perception of an existing asset position and the perceived utility of investment alternatives. A number of researchers have recently endorsed it as a viable explanation for the observed escalation effects (Arkes & Blumer, 1985; Garland, 1990; Northcraft & Neale, 1986; Whyte, 1986). If the Prospect Theory interpretation of escalation behavior is correct, then a focus on the risk perceptions of decision makers may be seen as a practical perspective on the escalation problem.

Thus far the escalation research has focused exclusively on the situation in which discontinuing further investment (i.e., withdrawing from the field entirely) is the only available alternative to reinvestment. In this paper we describe how the availability of alternative risky means of recovering sunk costs and profiting further affects predictions about behavior in escalation situations that can be derived from Prospect Theory. These new predictions were tested in laboratory experiments manipulating information concerning risk and the possible return of alternative investments, in addition to responsibility for the prior decision.

PROSPECT THEORY AND THE ESCALATION CONTEXT

Prospect Theory suggests that decision makers respond differently to risks concerning perceived gains than they do to risks concerning per-

ceived losses. The theory contains several principles and makes several unique predictions, but we will limit its description to those principles that are relevant to escalation.

Reinvestment versus Withdrawal

Within Prospect Theory, the decision maker perceives his or her asset position using a psychologically based value (or utility) function. This utility function is concave in the domain of gains and convex in the domain of losses. As shown in the Fig. 1 diagram, the convex "loss" side of this function is steeper than the concave "gain" side of the function. Accordingly, the value of marginal gains is less than the absolute value of marginal losses. Therefore the individual is predicted to be more risk averse when perceiving the prospect from the standpoint of its potential to establish gains and more risk prone when taking the perspective of one hoping to minimize losses. Kahneman and Tversky (1979) referred to this

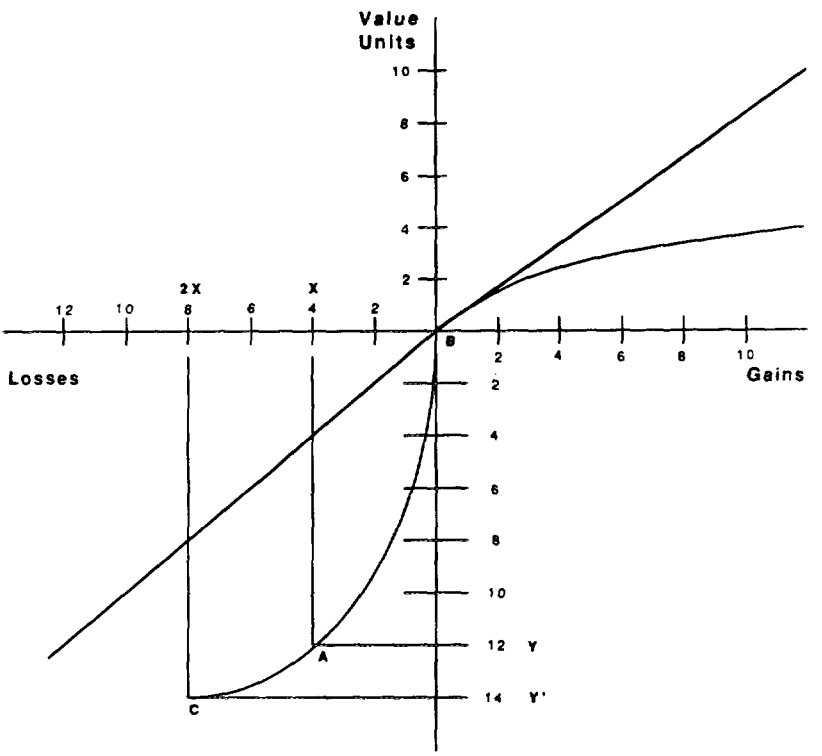

FIG. 1. Prospect Theory value function (from Kahneman & Tversky, 1979), incurred sunk costs, and alternatives of reinvestment and withdrawal (example from Garland, Sandefur, and Rogers (1990)).

as the "reflection effect." A program of studies reported by Kahneman and Tversky (1979, 1980; Tversky & Kahneman, 1981) established this general utility function and the reflection effect. The utility function was also supported in a thorough study conducted by Fishburn and Kochenberger (1979), and a number of independent studies have supported the reflection effect (e.g., Budescu & Weiss, 1987). A second implication of Prospect Theory's value function can be called the *reference effect*. With the reference effect, the perceived value of a prospect depends on its size in relation to the status quo. It is clear from the concave gain and convex loss sides of the value function that as one stands further out on either curve, the value of marginal gains or losses decreases.

Bazerman (1984) suggested that Prospect Theory's reflection effect may help to explain escalation. In the sequential investment context, the utilities perceived by a decision maker who is responsible for previous losses differ from those of the decision maker who simply inherited the consequences of another party's decision. The reference point from which this latter "nonresponsible" decision maker evaluates the previously chosen prospect is at the risk-neutral zero-point of the utility curve because he or she does not value the sunk cost. Because of an experienced sunk cost, the "responsible" decision maker is placed on the "loss" side of the curve, say, Point A on Fig. 1. He or she has expended X dollars with no return and must decide whether to abandon the initiative or attempt to recoup the loss by risking further loss. Garland, Sandefur, and Rogers (1990) cogently describe the decision maker's calculus from the perspective of Prospect Theory:

> The first alternative is riskless, whereas the second offers either a potential gain in utility of Y units (should the entire investment be recovered and the individual wind up at Point B) or an additional loss of $Y' - Y$ units (should the individual fail to receive any return and wind up at Point C). The convex shape of the value function under loss assures that $Y' - Y$ will always be less than Y. Given an even chance of additional loss or complete recovery of the entire investment, the individual ought to prefer additional investment to withdrawal (p. 721).

This is especially true considering another principle from Prospect Theory called the *certainty effect*. The certainty effect refers to the overweighting of certain outcomes relative to outcomes that are merely probable. In the conventional commitment escalation laboratory decision scheme, the failure to reinvest is perceived as a certain loss (Northcraft and Neale, 1986). These principles explain why "a person who has not made peace with his losses is likely to accept gambles that would not be acceptable to him otherwise" (Kahneman and Tversky, 1979, p. 287).

Laboratory experiments have demonstrated support for the reflection effect in escalation by finding a significant effect of the framing (loss/gain) of decision scenarios (Barton, Duchon, & Dunegan, 1989; Bateman &

Zeithaml, 1989). Garland and Newport (1991) demonstrated the role of the reference effect in escalation in finding that responsible decision makers were significantly influenced by the level of the sunk cost relative to the initial asset position. They found that reinvestment increased with the proportional size of the sunk cost.

These Prospect Theory predictions regarding escalation behavior, however, apply only to situations in which reinvestment is the riskiest option available and the decision to withdraw does not imply a cost. As explained below, this is sure to be the case only when there are no alternatives to reinvestment besides withdrawal.

Reinvestment versus Alternative Investment Opportunities

Suppose a decision maker who is responsible for a previous failed investment decision faces a choice between two alternatives that differ in risk. One of these is an option to reinvest in the original initiative. Under both alternatives, success of the investment monetarily recovers the previous loss. Successful risk taking is also expected to be rewarded in proportion to the magnitude of the risk incurred by the decision maker's selection (i.e., the expected utilities E(u) of the two alternatives are equal). Prospect Theory's reference effect predicts a risk biased perspective in this situation because the prior loss places the decision maker in a perceived deficit situation. From the reflection effect, one can also ascertain the "responsible" decision maker's risk orientation after comparing two alternatives from this deficit perspective. In this context, the marginal (relative to alternative investments) expected value of losses, which are evaluated on the steeper side of the function, will be more than the marginal expected value of gains. This will always be true provided that success with either the risky or the conservative prospect permits recovery of the sunk cost to a point at or above the status anteal. This implies that whenever viable investment alternatives exist, there will be a reversal of the established hypothesis that negative feedback and sunk costs create risk proneness.

To illustrate, we return to the earlier example in which the decision maker has incurred a sunk cost (one unit in this example) and is placed at Point A on the loss curve presented above. Suppose the individual faces the investment situation described above and the alternative investments are labelled Option 1 and Option 2. Option 1 happens to be noticeably riskier, and it is the reinvestment option. Failure on Option 1 costs four units and the individual moves from Point A to Point C (see Fig. 2). Failure on the more conservative Option 2 costs two units, and in this case the individual would move only to Point B. The value of the loss experienced with the failure of Option 1 relative to the failure of Option 2 is $Y2 - Y1$, or two units.

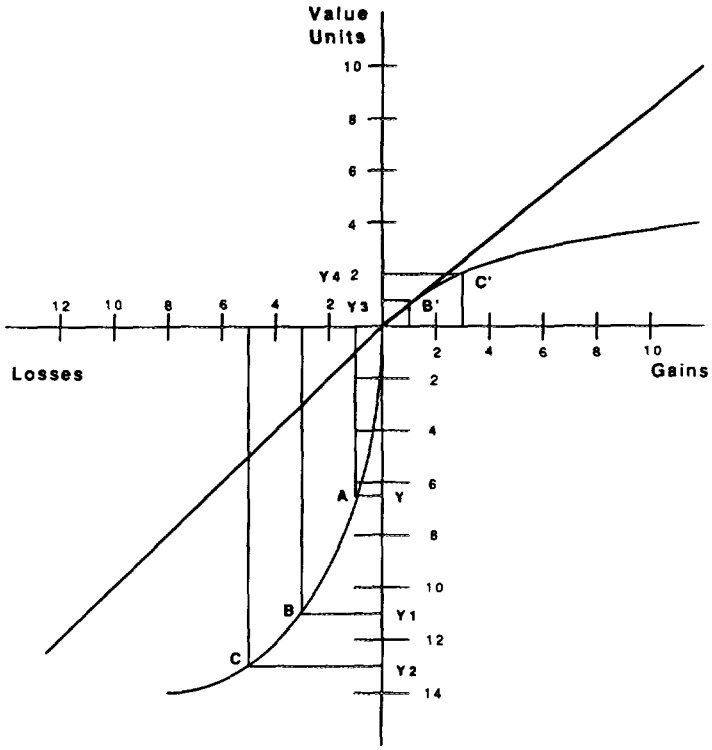

FIG. 2. Prospect Theory value function with incurred sunk cost and two alternative risky prospects.

Success with Option 2 permits full recovery of the sunk cost plus one unit, placing the individual at Point B′, thereby gaining approximately one unit of positive value (*Y*3). Success with Option 1 permits full recovery and an additional monetary gain of three units. This places the individual at Point C′, two units of positive value (*Y*4). Therefore the marginal value of failure under a high risk (or risk prone) orientation (*Y*2 − *Y*1 = two units) is in this case greater than the marginal value of success under a high risk orientation (*Y*4 − *Y*3 = one unit). The reverse holds for conservatism. Hence under profit maximizing norms the individual should select Option 2, the more conservative option. Thus in this example the decision maker would not be expected to choose reinvestment, but that is merely because it happened to be the riskier option.

The decision maker who has *not* incurred a sunk cost by being responsible for the initial investment faces the options from a neutral reference point at the origin. The utility curve is the straight diagonal line intersecting the origin (see Bazerman, 1984). The marginal value of gains and

losses from this perspective is equivalent at all points. Consequently the marginal value of gains and losses for Options 1 and 2 are the same. Hence there is no relative advantage between risk proneness and risk aversion.

Implications of Alternative Investment Opportunities

From this analysis, it is clear that risk preferences depend on the status of alternatives. Riskiness may be advantageous when withdrawal is the only alternative to reinvestment, but conservatism may prevail when other means of recovery are available. Researchers endorsing a Prospect Theory interpretation of commitment escalation have recently argued that the responsible decision maker is more risk prone following the negative feedback about his or her prior decision. Indeed, among peripheral findings in an experimental study by Kameda and Davis (1990), subjects in a gambling situation who had experienced a loss were more risk prone than subjects who had not experienced a loss. This suggests a sunk cost effect that is consistent with Prospect Theory. However, if the less risky alternative gamble had permitted the gambler to recover his or her sunk cost (and assuming the gamble is not skewed), this alternative should be preferred according to the theory. A strong Prospect Theory interpretation of escalation would posit that these relative risk considerations completely determine investment decisions. Hence when risk levels differ between alternative prospects, this information should override other considerations such as the motivation to justify past behavior.

Most published escalation studies do not include alternative investment opportunities after the initial investment decision. Often two alternatives in an initial investment scenario narrow into one in a second scenario. Such an "escalate or withdraw" scenario may be less prevalent in business decisions than are decision scenarios involving more than one means of recovering sunk costs. From the above analysis, the Prospect Theory prediction should be toward more conservative decisions in these latter contexts. In fact, positing withdrawal as the exclusive alternative to reinvestment could be viewed as the decomposition of risky prospects into distinctive elements. In the typical 'escalate or withdraw' scenario, the subject does not have to consider the opportunity cost of the money, which is normally slack funding, because there is only one investment option available. The risk and possible profit associated with alternative uses of the slack resources, should the decision maker abandon the original initiative, are not considered. The isolation of these elements from the conventional escalation decision scheme may change preferences relative to what would be exhibited in a more comprehensive decision scheme. Northcraft and Neale (1986) asserted that the researcher must recognize in such scenarios the opportunity cost of any resource diver-

sion, be that a withdrawal or a reinvestment. "The choice of the "setback scenario," then, should be between alternative courses of action which *both* [italics theirs] include certain loss and possible gain components. This suggests that aversion to certain loss should not play a role in these decisions" (p. 350). Their experimental results indicated that opportunity costs were not considered by subjects in a typical escalation versus withdrawal scenario. Although it did not eliminate escalation tendencies, heightening the salience of opportunity costs significantly decreased subjects' tendency to persist in a failing course of action. Northcraft and Neale suggested that subjects' misdirected perception that failure to reinvest implies a certain loss is an important demand characteristic inherent in most laboratory investigations of commitment escalation.

If the risk levels of investment alternatives do not differ, the responsible decision maker may continue to look to prior performance information (i.e., what he or she previously chose and the implications of this awareness) as a basis for choosing between alternatives. This would be expected under the established psychological interpretations of escalation that are premised on justification processes. However, when there is at least one alternative investment and the risk levels and expected returns of the candidates are the same, the *nonresponsible* decision maker can also look to prior performance information to justify *avoidance* of the reinvestment option. This should occur because the nonresponsible decision maker is not motivated to justify the previous decision, and therefore the only discriminating evidence from which to choose between options is the negative feedback concerning the previously chosen alternative. In the 'escalate or withdraw' scenario, on the other hand, some nonresponsible decision makers will prefer reinvestment because that appears to be the only means to accomplish future gains, whereas others may focus on the poor historical performance of the reinvestment option and accordingly withdraw. The indeterminate investment preference typically found among nonresponsible subjects may therefore be caused by the mixed character of the situation perceived by them. Incorporating alternative investments into the decision scheme eliminates the certain loss associated with withdrawal. Thus, even though the presence of alternative investments may diminish reinvestment behavior (McCain, 1986), incorporating alternative investments should increase the difference in reinvestment tendencies between responsible and nonresponsible decision makers.

The validity of the above analysis depends on whether the decision of a failing investor is determined by his or her risk orientation. When faced with a viable alternative to reinvestment that has a noticeably different risk level, risk orientation should be conservative. Furthermore, risk orientation should be more important to the decision maker than the impli-

cations of responsibility for any prior decision, and thus risk differences among candidate investments may override escalation tendencies. Previous tests of Prospect Theory in the escalation context have not directly assessed the risk orientation of decision makers, nor determined how risk differences between alternatives might eliminate the tendency toward escalation behavior.

EXPERIMENT 1

If risk and possible return does not vary between the alternatives (i.e., it is high for both options or low for both options), conventional escalation should be expected among responsible decision makers. However, as noted above, when there is a viable recourse to reinvestment, the information concerning poor performance of the previously chosen investment may be overweighted among nonresponsible decision makers who hope to profit. Hence nonresponsible decision makers should prefer the alternative investment.

H1: Among subjects facing two alternatives that are equivalent in risk (high or low) in the second investment scenario, those that were responsible for the initial investment decision will exhibit a significant preference for reinvestment.

H2: Among subjects facing two alternatives that are equivalent in risk (high or low) in the second investment scenario, those that were not responsible for the initial investment decision will exhibit a preference for the option that is an alternative to reinvestment.

In most experimental studies of commitment escalation, after making an initial investment decision the subject chooses how much money from a pool of slack resources will be reinvested in the previously chosen project. Thus the level of reinvestment can vary widely among subjects. The above hypotheses, however, are formulated in terms of preferences concerning reinvestment. Subjects chose one investment or another, allocating all available money to their chosen project. This was done in order to provide for a distinct choice based on risk–return tradeoffs. This approach may also enhance the generalizability of this experiment to managerial decisions. While continuous dependent variables (e.g., total dollars invested in each project) may facilitate analysis of variance or regression, we believe they will tend to compromise the critical nature of the choice between alternatives.

An essential manipulation necessary to test escalation effects is the assignment of subjects into "responsible" and "nonresponsible" groups. Published studies vary in that sometimes "responsible" decision makers are simply told they were responsible for the initial decision, and frequently the parties are uneducated concerning the contingencies of this initial decision. For the purpose of fidelity all subjects, "responsible" and

"nonresponsible," must be equally aware of the contingencies of the first decision.

A third essential element of the escalation context is the provision of negative feedback following the initial decision (Staw, 1976). The initial decision must have the marks of a failure and lead to perceptions of a sunk cost. In addition, future outcomes must be uncertain, but the information must not be so vague or ambiguous as to encourage distortion by the decision maker (McCain, 1986). Finally, these alternative prospects should not be framed in a manner that would distort risk perceptions.

Method

Design, stimuli, and procedure. Subjects were randomly assigned to four experimental conditions. This was a 2 × 2 design in which responsibility for a prior investment decision (RESPONSIBILITY) and risk level (held equal between two extant alternatives at a high or a low level) were manipulated. The overall research design is detailed in the top half Table 1.

The second author administered the experimental stimuli. Each subject received instructions for the experimental decision materials that were self-contained. All subjects faced an initial investment scenario in which

TABLE 1
DESCRIPTION OF DESIGN FOR EXPERIMENTS 1 AND 2

	1st decision scenario	2nd decision scenario
Experiment 1		
Riskiness of alternatives is equal (n = 170)	High responsibility: S chooses project "A" or project "B"	Both investments are risky Both investments are conservative
	Low responsibility: "A" predetermined choice or "B" predetermined choice	Both investments are risky Both investments are conservative
Experiment 2		
Riskiness differs between alternatives (n = 195)	High responsibility: S chooses project "A" or project "B"	Reinvestment is risky option Reinvestment is more conservative option
	Low responsibility: "A" predetermined choice or "B" predetermined choice	Reinvestment is risky option Reinvestment is more conservative option

they were told, "You are to act in the role of Financial Vice President [of a "technologically oriented" manufacturing company called "Generico"] and are asked by the Board of directors to make a business decision. You are given only a limited amount of information about Generico, two major products, and the market, but the information should still be sufficient for a business school student to make a prudent decision." Following a description of the company (approximately 50 words), the two products (projects "A" and "B") were described in separate vignettes averaging approximately 150 words each in length. For each product, information was given concerning the nature of the product, potential marketability, costs per unit produced at a given production level, patent information, total capital outlays to date (approximately the same for both products), and the potential advantages of further investment. Both products were computerized aircraft components. Product A sensed other aircraft at an unsafe proximity and signalled the flight crew accordingly. Product B detected hazardous wind sheer effects in the local environment. The hazard potential of the phenomena safeguarded by each of the two products was described in each vignette.

Prior to distributing the materials, subjects were instructed to follow the directions given on the underside of the handouts after making their first decision. They were also asked to provide a one or two sentence rationale for their second business decision. The second scenarios were folded in half and stapled to the backs of the initial scenarios. For high RESPONSIBILITY subjects, two documents were stapled in a manner to facilitate separate opening. On the back of each scenario was the words, "Open if chose Project A" or "Open if chose Project B." Low RESPONSIBILITY subjects had only one attached document and this included an instruction to open it after their initial decision.

The high RESPONSIBILITY scenario concluded with, "The board has discussed the relative merits of the two products concerning the potential returns on the additional funding . . . The Board sees the risks and expected risk-return associated with the two options as being equal . . . So the decision has been thrown in your lap. . . . Which project should receive [an] additional $10 million [in R&D funding]? (Please circle one): Project A Project B."

For "nonresponsible" (low RESPONSIBILITY) subjects, the conclusion of the scenario read, ". . . The Board saw the risks and expected risk–return associated with the two options as being equal, although your predecessor in the position of Financial Vice President and his advisors disagreed with the board concerning the parity of the two projects. After considerable deliberation, he chose to invest the [additional $10 million in R&D] funds in Project A [or B; The chosen project was varied randomly between A and B across these nonresponsible subjects]. This decision

occurred immediately prior to his scheduled retirement. . . . Now, you must register your vote concerning a new policy for the Board of Directors. Should a new rule be created whereby the Financial Vice President is provided full responsibility for R&D budget allocations? (Please circle one): YES NO." This latter decision was irrelevant to the experiment but it fulfilled the purpose of encouraging subjects to seriously evaluate the decision scenario information and to record a decision in the same manner as did "responsible" (high RESPONSIBILITY) subjects surrounding them in the classroom. Eighty percent of the subjects answered "no" to this question. There was no statistical relationship between answers to this question and responses on the second decision scenario.

For all subjects the second decision scenario began as follows: "Six years have now passed since your business decision and events have transpired concerning Project A and Project B. You must now allocate $100 million in R&D funding. Again, you must allocate the entire amount of money to one project. . . ." Information regarding updated variable costs, selling prices, performance in the market, and market opportunities following the time of the first investment decision were given in separate vignettes for each project. However, information relevant to risk–return tradeoffs provided at the conclusion of each vignette was varied randomy. In half the cases the information indicated that choosing either reinvestment or the previously unchosen alternative was risky (high RISK); the opposite was true in the other half of the sample (low RISK). The probability of success (the manipulated RISK factor) hinged on a technical advance. Three expert estimates of the probability of the advance were provided in order to give the subject high consensus information on the relative riskiness of the two alternatives. The expert estimates varied slightly from each other in order that the subject should believe that the risk information, although obviously indicating a sizable risk difference between the alternatives, was not completely certain. The information was provided to low RISK subjects as follows: "One engineering expert rates the advance only as a 75% [20% for high RISK conditions] possibility, another an 80% (25% for high risk conditions) chance, and the other an 85% [30% for high RISK conditions] chance."

No information indicated any relative sunk costs in addition to the $10 million from the initial investment. However, negative feedback was provided for the project that had been chosen in the initial investment scenario. When Project A had been chosen in the first decision scenario (Project B was not chosen), the second decision scenarios indicated that variable costs had increased substantially and no orders had been received from customers, whereas Project B "has done fairly well on the market", and had a 13% share of the $800 million annual market. When Project A was not chosen in the first decision scenario (Project B was

chosen), the second decision scenarios indicated that Project A incurred only a marginal increase in variable costs and hundreds of orders for the product had been received, whereas Project B "has not done well on the market", and had only a 2½% share of an $800 million annual market. Thus the project that was an alternative to reinvestment always had a slightly superior prior performance history than did the reinvestment option. The profiles were constructed to be approximately balanced for projects that were previously chosen and for projects that were not previously chosen.

The conclusion of the instrument read: "You must now choose the project (A or B) to which the $100 million R&D money will be allocated. Both investments are risky [for the high RISK condition; "Neither investment is a sure thing" for the low RISK condition], but the returns will make them profitable product lines. If you average the expert estimates of risk (not necessarily appropriate), your payback analysis indicates that the expected return on the $100 million is the same for both projects ($40 million gain). To which project will you allocate the $100 million? (Circle one): Project A Project B."

Subjects. Subjects (n = 172) were university juniors and seniors who were each enrolled in one of six sections of a management principles course at a major United States university. Seventy-eight (78; 46%) of these subjects were female. Participation was voluntary but was not compensated. None of the students enrolled in the six classes declined to participate. There were half as many subjects in the high responsibility condition (n = 58) as were in the low responsibility condition (n = 112). Minor differences in cell sizes (from one to three subjects) can be attributed to overestimating the number of student volunteers present for the experiment prior to randomly mixing the stimulus sets. Two subjects failed to complete the second decision scenario, thus reducing the analysis sample size to 170.

Results

We asked subjects to explain the reasoning behind their decisions in the second investment scenario for two reasons. First, we felt this would enable us to identify any misperceptions or distortions of the relevant manipulation information without priming the subject to focus on particular information. Second, we believe from our experience that such an accounting for decisions encourages the kind of thoughtful deliberation one would expect to be exhibited by the employed decision makers to whom we desired to generalize the results. In terms of the manipulation check objective, none of the subjects' explanations revealed any misperception of relative riskiness, the equality of the expected returns, or the nature of the decision context, each of which we had endeavored to make salient.

There was no significant preference for Project A or Project B among high RESPONSIBILITY subjects in the first decision scenario ($\chi^2(df = 1) = 2.48, p > .10$). The high and low RESPONSIBILITY groups differed significantly on their preferences for reinvestment ($\chi^2(df = 1) = 7.34$ ($p < .01$)). As shown in Table 2, low RESPONSIBILITY subjects exhibit a substantial preference for avoiding reinvestment, with 45 subjects choosing reinvestment and 67 opting for the alternative. Among high RESPONSIBILITY subjects, 36 reinvested in their previously chosen project and the remaining 22 selected the alternative. These differences are significant for the low RESPONSIBILITY subjects ($\chi^2(df = 1) = 4.32$ ($p < .04$)) and approach significance for the smaller high RESPONSIBILITY group ($\chi^2(df = 1) = 3.38$ ($p < .06$)). Thus the trend suggested support for H1, and H2 was supported. The pattern indicates the predicted divergence between high and low RESPONSIBILITY groups with high RESPONSIBILITY subjects preferring reinvestment and low RESPONSIBILITY subjects avoiding reinvestment.

A post hoc analysis separating subjects facing only high RISK alternatives and those facing only the lower RISK alternatives indicated that manipulated risk level was related to escalation behavior (see Table 3). In the high RISK condition there was a significant difference between the high and low responsibility conditions ($\chi^2(df = 1) = 6.69$ ($p < .01$)), but there was no difference between these conditions when subjects faced lower RISK alternatives ($\chi^2(df = 1) = 1.52, p > .20$). In the high RISK condition, nearly twice as many high RESPONSIBILITY subjects preferred reinvestment (19) as chose the alternative (10). Conversely, among low RESPONSIBILITY subjects in this high RISK condition, 64% (37 of 58) elected to avoid the reinvestment option.

EXPERIMENT 2

It was observed from the findings of Experiment 1 that conventional escalation behavior occurred when the risk levels of two investment al-

TABLE 2
OBSERVED FREQUENCIES OF REINVESTMENT CHOICES BY RESPONSIBILITY CONDITIONS WHEN RISK LEVELS OF ALTERNATIVE INVESTMENTS WERE EQUAL (EXPERIMENT 1)

	Reinvested?	
Responsibility	No	Yes
Low	67 $E(x) = 58.6$	45 $E(x) = 53.4$
High	22 $E(x) = 30.4$	36 $E(x) = 27.6$

χ^2 (1, $n = 170$) = 7.34 ($p < .01$).

TABLE 3
OBSERVED FREQUENCIES OF REINVESTMENT CHOICES BY RESPONSIBILITY CONDITION AND RISKINESS OF ALTERNATIVES (EXPERIMENT 1)

	Reinvested?	
Responsibility	No	Yes
	Both alternatives high risk[a]	
Low	37	21
	$E(x) = 31.3$	$E(x) = 26.7$
High	10	19
	$E(x) = 15.7$	$E(x) = 13.3$
	Both alternatives low risk[b]	
Low	30	24
	$E(x) = 27.3$	$E(x) = 26.7$
High	12	17
	$E(x) = 14.7$	$E(x) = 14.3$

[a] χ^2 (1, n = 87) = 6.69 ($p < .01$).
[b] χ^2 (1, n = 83) = 1.52 ($p > .20$).

ternatives, one of which was the reinvestment option, were transparent and equivalent. From the comparative analysis of marginal utilities under success and failure presented in the introduction, decision makers who are responsible for negative decision outcomes are expected to choose the more *conservative* of two subsequent options when risk differences exist. Because risk perception is predicted to be the determining factor, the decision makers should not exhibit a preference for or against reinvestment. Following established escalation theory, there should also be no risk or reinvestment preferences within a subject group that is fully informed about the initial decision but which did not actually make that original decision (i.e., a "nonresponsible" control group). These expectations are articulated more explicitly in terms of the following statistical hypotheses:

H3: Decision makers who were responsible for an initial investment decision that was unsuccessful will demonstrate a significant tendency to choose the more conservative investment option at a later time, regardless of whether it pertains to the reinvestment option or an alternative.

H4: Decision makers who were not responsible for the initial investment will not demonstrate any risk preference in the later decision.

H5: Neither of the decision making groups (responsible or nonresponsible) will demonstrate a within group preference for reinvestment.

H6: Responsible and nonresponsible groups will not differ on the preference for reinvestment.

Inclusive support for the above hypotheses would uphold Prospect Theory as an interpretation of commitment escalation, but in a way con-

trary to the established perspective that the decision maker is more risk prone after receiving the negative feedback and sunk cost information. Support for H3 in conjunction with support for H4, H5, and H6, would contradict the Prospect Theory interpretation of escalation behavior that has been applied to situations in which reinvestment is the only recovery option. Prospect Theory would be rejected as an escalation phenomena interpretation of escalation behavior if no risk preference were exhibited within H3 and/or if H4, H5, or H6 were rejected.

Method

Design, stimuli, and procedure. The design of Experiment 2 is illustrated in the bottom half of Table 1. Conditions were equivalent to those described above for Experiment 1, with two exceptions. The first exception was that the three engineering expert ratings of risk were different for the alternative investment project facing the subject in the second decision scenario than they were for the reinvestment option. This provided a maniuplation of RELATIVE RISK, rather than RISK. For half the subjects the risk of reinvestment was high (the 20–25–30% expert estimates of the probability of the technical advance) whereas the alternative investment was relatively low risk (the 75–80–85% expert estimates), and the opposite situation faced the remaining subjects. In addition to differences in risk, the possible return for both investments was different such that higher risk was compensated with higher possible return. RESPONSIBILITY was manipulated in exactly the same way as in Experiment 1. The other stimulus condition differentiating this experiment from Experiment 1 was the concluding statement of the second scenario. It read: ". . . The investment in Project [A or B] is risky, but the returns will make it a respectably profitable product line. . . . The product improvement [in Project B or Project A] would make a significant difference in the return and it is a safer bet than the improvements in Project [A or B]. . . . If you average the expert estimates of risk (not necessarily appropriate), your payback analysis indicates that the expected return on the $100 million is the same for both projects ($40 million market gain). To which project will you allocate the $100 million? (Circle one): Project A Project B."

Subjects. The subjects (n = 197) were each enrolled in one of five management courses at the junior and senior level at a university in the midwestern United States. Ninety-seven of these subjects (49%) were female. Participation was voluntary but it was encouraged by grade credit. No student rejected the opportunity to participate. Sets of materials corresponding to the different experimental conditions were produced for the entire sample, mixed randomly into one stack, and then divided according to the numbers of students from the five classes that

were listed as subjects. Minor differences among the four cell sizes can be attributed to the mixing process because over 200 sets were produced and randomized in the expectation that more subjects who had volunteered for the experiment would be in attendance on the day of the experiment. Among those instruments left undistributed, there was a slightly higher proportion of low RESPONSIBILITY conditions. In addition, two of the subjects did not complete the second decision scenario. One of these subjects, an international student, later expressed to the second author that she had had difficulty in understanding the stimulus materials. Thus the analysis sample size was 195. Together, the unintended events account for a difference of nine subjects between the high and low RESPONSIBILITY conditions.

Results

Content analyses of the subjects' written justifications for their second decisions again did not suggest that misperceptions of the stimuli might be responsible for decisions. Fifty of the subjects in the high RESPONSIBILITY condition chose Project A and the remaining 52 in that condition chose Project B in the first decision scenario, indicating no sample preference for a particular project description at the outset ($\chi^2(df = 1) = 0.04$, $p > .50$).

To test the first hypothesis (H3), we first constructed contingency tables (see Table 4) of reinvestment decision (reinvested or chose alternative investment) and risk of reinvestment relative to its alternative (REL-

TABLE 4
OBSERVED FREQUENCIES OF SUBJECT CHOICES IN SECOND INVESTMENT SCENARIO BY RESPONSIBILITY CONDITION (EXPERIMENT 2)

Choice between reinvestment and alternative	Relative risk of investments	
	Reinvestment was less risky	Reinvestment was more risky
	High responsibility[a]	
Chose alternative	19 $E(x) = 25.5$	33 $E(x) = 26.5$
Reinvested	31 $E(x) = 24.5$	19 $E(x) = 25.5$
	Low responsibility[b]	
Chose alternative	22 $E(x) = 20.3$	21 $E(x) = 22.7$
Reinvested	22 $E(x) = 23.7$	28 $E(x) = 26.3$

[a] χ^2 (1, n = 102) = 6.63 ($p < .01$).
[b] χ^2 (1, n = 93) = 0.47 ($p > .45$).

ATIVE RISK). In the high RESPONSIBILITY condition, the observed cell frequencies differed considerably from their expected values. Cell counts fell short of expected preferences when the reinvestment decision was risker and reinvestment was chosen ($n = 19$, $E(x) = 25.5$) as well as when the alternative investment was chosen and it was riskier ($n = 19$, $(E(x) = 25.5)$. Cell counts exceeded expected values when reinvestment was chosen and it was more conservative ($n = 31$, $E(x) = 24.5$) as well as when a more conservative alternative investment was chosen ($n = 33$, $E(x) = 26.5$). The contrast of the 64 conservative decisions against 38 riskier decisions is significant ($\chi^2(df = 1) = 6.63$, $p < .01$). Hence H3, which pertains to risk avoidance preferences among high RESPONSIBILITY subjects, was supported. With 50 subjects choosing to reinvest and 52 choosing the alternative investment, there was no escalation effect ($\chi^2(df = 1) = 0.04$, $p > .50$). Hence H5, as it pertains to the lack of an escalation effect among high RESPONSIBILITY subjects, was supported.

As shown in Table 4, cell counts in the contingency table for low RESPONSIBILITY subjects did not differ from their expected values. The contrast of the 43 conservative decisions against 50 riskier decisions is not significant ($\chi^2(df = 1) = 0.47$, $p > .45$). With 50 subjects choosing to reinvest and 43 choosing the alternative investment, there was no escalation effect ($\chi^2(df = 1) = 0.53$, $p > .45$). Hence both H4, which pertains to a lack of risk orientation effect among low RESPONSIBILITY subjects, and H5 (as it pertains to a lack of reinvestment preference among low RESPONSIBILITY subjects) were supported. Furthermore, risk perceptions were significantly more determining of investment choices among high RESPONSIBILITY subjects than among low RESPONSIBILITY subjects ($\chi^2(df = 1) = 5.53$, $p < .02$).

To test H6, reinvestment in the high RESPONSIBILITY condition was compared with reinvestment in the low RESPONSIBILITY group. There was no difference in reinvestment tendency ($\chi^2(df = 1) = 0.27$, $p > .50$).

In summary, the hypothesis that responsible subjects would prefer conservative decisions was supported, as was the hypothesis that nonresponsible subjects would demonstrate no risk preference. There was also no significant preference for reinvestment either within the two responsibility conditions or between these conditions. Thus the manipulation of risk between investment alternatives may have eliminated a tendency toward escalation such as was observed in Experiment 1.

GENERAL DISCUSSION OF EXPERIMENTS 1 AND 2

The experiments provided results consistent with a Prospect Theory interpretation of commitment escalation. The decision scenarios followed the classic escalation context that includes negative feedback and sunk

costs pertaining to an initial investment decision. Escalation was the preferred behavior only when risk orientation was controlled for by making the risk levels of the two alternative projects equivalent in Experiment 1. When those risk levels were maniuplated to vary between the chosen and the unchosen alternative in Experiment 2, however, information concerning relative risk, rather than the psychological implications of a previously chosen alternative, determined the subsequent investment choice. This was not likely the result of a skewed bargain, because the conservatism effect was observed only among subjects who were responsible for the initial investment.

Previous studies have separately demonstrated framing (Barton et al., 1989; Bateman & Zeithaml, 1989) and reference (Garland & Newport, 1991) effects in the escalation context. Escalation was observed in these studies, regardless of decision frame or reference level; the manipulated variables influenced only the magnitude of escalation preferences. The present experiments went further by showing that varying risk levels between alternative courses of action fully explained escalation behavior. A complex pattern of hypotheses was supported, and the Prospect Theory value function is to our knowledge the only existing framework that explains this pattern of findings. Hence this study lends much credence to the claims of prior authors that Prospect Theory is a viable scientific explanation for the escalation phenomenon. These results also extend the Prospect Theory interpretation to situations in which reinvestment is not the only available means by which the decision maker can recover sunk costs. As predicted by the comparison of marginal utilities under success and failure, risk preferences appeared to be conservative in this situation. This is in sharp contrast to the risk prone orientation predicted for the conventional escalation scenario in which the only alternative to reinvestment is withdrawal from the field. In the latter situation, any decision to proceed with profit-oriented behavior can be seen as an example of escalation.

We hope this study will further the questioning of escalation research methodology begun by McCain (1986) and Northcraft and Neale (1986) by creating an awareness of factors that may influence risk perceptions of investment alternatives. Most importantly, in our view, the existence of viable alternatives to reinvestment besides withdrawal should receive more attention. An array of investment options is a more common "real-world" scenario than that found represented in the 'escalate or withdraw' experiment. In fact, the omission of alternatives can be seen to decompose the decision problem because the opportunity costs of slack capital are not considered (Northcraft & Neale, 1986). At and beyond the range of sunk cost recovery, the presence of alternatives may change the risk orientation of the decision maker from risk prone to risk averse. This may

reverse the preference for reinvestment if that reinvestment is seen as more risky than its investment alternatives.

When risk levels of alternatives and their possible returns were held equal in Experiment 1, feedback concerning prior performance was taken into consideration by both responsible and nonresponsible decision makers. This performance feedback had different implications for these two groups, however. Responsible decision makers preferred to reinvest in their previously chosen course of action, whereas individuals who had inherited the previous decision and its consequences tended to pursue an alternative project. Thus the decision scheme positing mutually exclusive investment alternatives that both provided viable opportunities to recover sunk costs created a wide gulf between responsible and nonresponsible decision makers. Under the conventional escalation versus withdrawal scenario, nonresponsible decision makers are seen to be indeterminate in their preferences for or against escalation. In attempting to discriminate between two options having forecasted equivalent expected returns in this study, apparently the negative feedback pertaining to the previously chosen project made it the less attractive option for nonresponsible individuals. Hence the presence of viable alternatives appears to promote rational avoidance behavior stemming from information concerning historical performance, provided that the decision maker is not motivated to justify the previous loss.

The results of Experiment 1 may be counterintuitive because reinvestment behavior emerged even when negative feedback about the initial investment was provided and there were viable alternatives that were equal to the reinvestment option in risk and possible return but which had better track records. This suggests strong support for justification theory. Extrapolating from the analysis in which risk level was varied between alternatives, a Prospect Theory interpretation of this finding might view reinvestment under an equal risk circumstance as a conservative decision. Some existing psychological interpretations of escalation support this conjecture. One perspective holds that the decision maker has an internal need to justify prior failed decisions, and this results in a reinterpretation of previous behavior that gives it retrospective rationality (Staw, 1981). A second perspective, based on Bem's (1972) self-perception theory, suggests that decision makers simply infer that the previously chosen alternative was more rational because it seems logical in light of their previous behavior (Ross & Staw, 1986). Within both of these perspectives reinvestment would appear to follow a conservative calculus. The decision maker is seen to act on the basis of his or her prior behavior because he or she can be more certain about the causes of prior behavior than other variables surrounding the decision context. Alternatively, McCain (1986) pointed to attribution theory in arguing that rein-

vestment in the face of other viable alternatives permits the decision maker to make a covariant attribution that the previous failure was or was not caused by unstable factors. If the same investment fails again, its failure may be seen to follow stable causes. In support of this perspective, his results indicated that escalation diminished at a fairly constant rate following the initial trials. This too indicates a conservative posture because it suggests that the alternative perceived to be more certain is initially preferred. McCain's (1986) findings could also suggest that escalation behavior is a transient phenomenon. It is very likely, however, that in many important investment situations a single act of escalation is the catalyst for a confluence of events that determines the situation in future investment scenarios and forces continuing reinvestment. Ross and Staw (1986) illustrated this in a case analysis of the city of Vancouver's investment in hosting Expo '86. Following an initial reinvestment decision by a responsible individual, a variety of political, economic, and task-related factors were seen to be set in motion toward a stable pattern of escalation. This suggests that one-trial escalation studies may indeed generate knowledge useful to address practical resource allocation problems.

One serendipitous finding of Experiment 1 suggests an intriguing avenue for future research. The difference between high and low responsibility groups when risk levels were held equal was stronger under the high risk conditions. This is somewhat surprising because high task importance, a factor that is affected by risk levels attached to outcomes, tends to be associated with more sophisticated decision processes (see the review by Ford, Schmitt, Schechtman, Hults, & Doherty, 1989). One possible explanation for the present finding is that risk levels affected the decision makers by means other than biasing their expected marginal utilities concerning gains and losses. A risk neutral individual, like anyone, experiences the demand inherent in a high risk situation and becomes aroused by it. As shown in literatures examining effects of novel task stimuli, social facilitation, and physical stress exposures, individuals tend to exhibit dominant (as opposed to more learned) responses to such demand situations (cf. McGrath, 1976; Zajonc, 1965). Within this perspective, responsible decision makers' failure to discount prior performance feedback in evaluating alternative prospects could be seen as a redress to dominant cognitive tendencies. Becoming motivated by the implications of prior performance may be a regression to a "learned" response from the first decision scenario. The non-trend response of nonresponsible decision makers, on the other hand, may be explained by their lack of a dominant learned response from the initial scenario. Perhaps the nonresponsible decision maker can be maintained as more rational than the decision maker who is responsible for prior losses only when the decision scheme creates heightened cognitive arousal as occurs under high risk.

Replicating this finding under different conditions that should lead to arousal, such as decision task novelty or high task importance, could support this conjecture. Prospect Theory provides an alternative interpretation of this finding, however. It is possible that under conditions of low risk options all subjects formulated the problem in terms of a final asset position and thus there was no reference effect. Kahneman and Tversky (1979) note, however, that when all alternatives are very risky, a final asset formulation will not negate the reference effect (p. 287). Future studies might seek to measure subjects' risk perceptions and the parameters of their utility functions in an effort to separate these alternative interpretations of escalation differences under uniformly high and low risk situations.

Replication of the present findings using expert decision makers, different decision contexts, and alternative risk-return levels is needed. For example, one limitation of the present findings is that success with either alternative in the second decision scenarios very clearly recovered the sunk cost. Prospect Theory would predict that alternatives that do not recover sunk costs should be foregone. Such alternatives were not examined in this study. In addition, alternative investment opportunities are not always mutually exclusive as they were in this study. Future experiments might apply this framework to unconstrained distributive resource allocation decisions. Studies should also examine "fresh" projects that are alternatives to reinvestment but which were not considered in the initial decision scenario. The decision maker seeking a means to justify previous losses may be even better disposed to an alternative that emerged propitiously after the initial investment. Factors such as project risk could take on added importance in this situation because reinvestment would not be the only means to justify the previous losses; the misfortune of not previously having acceptable alternatives can be blamed.

There is no inherent conflict between the escalation theories focusing on justification processes and the Prospect Theory interpretation. Because nonresponsible decision makers appeared to be risk-neutral, the present findings support the established perspective that organizations should uncouple investment decisions from the responsibility accompanying previous losses. Besides such areas of agreement, justification concepts and Prospect Theory complement one another in other areas. It is plausible, for example, that justification processes explain why sunk cost information affects the decision maker in such a way that prospects are evaluated from a deficit perspective. Thus while Prospect Theory may explain a basic mechanism driving escalation behavior, the wealth of literature on psychological theories of escalation may potentially help to explain how individuals arrive at different risk perceptions. On the other

hand, continuing research evidence for an important role of risk orientation in the escalation context will suggest an important boundary condition to the justification theories of commitment escalation. The Prospect Theory interpretation of escalation highlights the significant role of risk recognition and risk orientation and it can therefore make a range of distinct predictions. As noted above, Prospect Theory would suggest that nonrationality in these types of investment situations can be reduced by formulating the investment problem in terms of final assets rather than in terms of gains and losses. This would then set the reference point to zero and eliminate risk preference in all situations except for when alternatives are uniformly very risky (Kahneman & Tversky, 1979). We are encouraged that further theoretical development within the escalation literature, cast within frameworks that permit derivation of responsible and nonresponsible decision makers' utility functions, may soon lead to practical game theoretic models of sequential resource allocation decisions. Following this perspective, which mixes the decision maker's psychological reality with economic rationality, escalation theory may become increasingly rich for researchers and informative to policy makers.

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