Preferences and Decision Errors in the Winner's Curse

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Abstract: The winner's curse is one of the most well documented empirical deviations from rational behavior. The primary explanation for the winner's curse is decision error: bidders do not realize that their bids result in lotteries with negative expected value. Given many unsuccessful attempts to reduce winner's curse behavior, this paper hypothesizes that, in addition to decision error, some people prefer these lotteries. We test this hypothesis with two experiments. Study 1 shows that half the subjects accept a significant number of lotteries that are objectively identical to positive bids in the Takeover game but that cannot be explained by the decision error used to explain bids in the Takeover game. Study 1 also finds that half the subjects make decision errors. These results offer a positive interpretation on past efforts to reduce decision error; whereas past studies implicitly assume that eliminating 100 percent of winner's curse behavior reflects the highest possible success, the current results suggest that no more than half the subjects prefer avoiding the winner's curse even with no decision error. Study 2 shows that preferences consistent with winner's curse behavior can only partially be attributed to risk-seeking, and can mostly be attributed to contextual factors beyond the monetary distribution. These results reinforce substantial evidence that preferences over lotteries are not independent of the context in which the lotteries are presented.

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I Introduction

Economist's have recognized the importance of asymmetric information in markets in which buyers are less informed than sellers since Akerlof's seminal work on the "Market for Lemons," (1970). In these markets, rationality requires buyers to incorporate the information asymmetry into their bidding strategy. However, Kagel's (1995) literature review shows that bidders commonly bid above the expected value maximizing bid and the bids often have negative expected value. This overbidding, called the *winner's curse*, represents one of the most well documented deviations from rational behavior in the economics literature. The winner's curse has been observed in many markets including public and private auctions (e.g., Capen et al. 1971, Kagel and Levin 1986 and references therein), corporate takeovers (Roll 1986), the under-pricing of initial public offerings (Levis 1990), free agency in baseball (Cassing and Douglas 1983), and see Kagel (1995) and Foreman and Murnigham (1996) for additional references. Even stark environments with only one buyer and seller robustly exhibit the winner's curse (Bazerman and Samuelson 1983).

The predominant explanation for the winner's curse is decision error resulting from task complexity (Idson, et al. 2003; Tor and Bazerman 2003; Charness and Levin 2005). To understand the decision error, we must describe the task. In Samuelson and Bazerman's stark Takeover task (1985), the seller knows his firm's value v with certainty. The buyer bids b to acquire the firm knowing v is distributed uniformly on [0, 100] and that his value is 1.5*v. The buyer's profit is 1.5v-b if he acquires the firm and 0 otherwise. Assuming sellers only sell if b = v, the buyer's expected profit if his bid is accepted is -0.25b (for 0 < b = 100). This expected profit is negative since an accepted bid means the firm's value is distributed uniformly on [0, b], so the expected value of 1.5v-b = 0.75b-b = -0.25b. Though the risk-neutral or risk-averse utility maximizing bid is 0, most buyers across many manipulations make positive bids.[1,2]

The implicit decision error resulting in positive bids is that buyers don't understand the lottery they obtain when they make positive bids. More precisely, the decision error consistent with the finding that many bids are between 50 and 75 is the faulty logic of buyers who assume that since the firm's value is on average 50 to the seller and 75 to the buyer, bids between 50 and 75 will on average be accepted and on average the buyer will have bid less than his value. This reasoning ignores that sellers only accept a bid if the bid is greater than the seller's value.

This paper proposes an additional explanation to decision error that can explain the positive bids. Specifically, this paper argues that preferences are another reason for positive bids.[3] The preference hypothesis implies that there is a ceiling to the proportion of people who prefer to avoid the winner's curse even if they do not make any decision errors.

This paper estimates the ceiling effect through an experiment. Subjects participate in the Takeover task and a second task in which they may either accept or reject lotteries that are objectively identical to the lotteries they receive if they make positive bids in the Takeover task. For example, bidding 50 produces the lottery that has a 50% probability of $0 profit and a 50% chance of profit distributed uniformly on [-$5.00, $2.50]. People who accept these lotteries indicate preference for positive bids in the Takeover task.[4]

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[1] This Takeover task was first studied by Bazerman and his colleagues (Samuelson and Bazerman 1985, Carroll et al. 1988 and Ball et al. 1991). By the mid 1990s research showed the robustness of the winner's curse (i.e. b>0) across incentives, feedback, experience, subject pools and other manipulations (Foreman and Murnighan 1996 and Grosskopf et al. 2003). Foreman and Murnighan (1996: p178) conclude; "Neither information, experience, time, a variation in endowments, nor a problem that allowed the possibility of profitable bids helped them learn to avoid the curse. It was extremely persistent."

[2] It is interesting to note that though b=0 is a risk neutral bidder's optimal bid, guaranteeing the seller keeps the firm, the efficient outcome is for the buyer to acquire the firm (assuming efficiency equals the simple sum of monetary values to the buyer and seller). It is easy to show that the ex-ante sum of monetary value to the seller and buyer equals $v+b^2/400$ for any bid b on [0, 100]. Thus, while avoiding the winner's curse (i.e., b=0) is optimal for a risk neutral buyer, it is inefficient.

[3] We defer until later the discussion of what preferences may explain positive bids. We see this work closely paralleling the developments in the literature on ultimatum games that initially addressed the puzzling behavior of responders who reject positive offers. Extensive research has lead to the incorporation of fairness norms into utility functions (e.g., Bolton and Ockenfels 2000).

[4] Accepting a lottery can also imply other decision errors than occurs in the Takeover task. The data analysis addresses this issue.

We find, assuming no noise in the lottery task, nearly two-thirds of the population accepts a positive number of lotteries. Allowing for substantial noise, we still find that nearly half the population accepts a positive number of lotteries. Since 50 percent or more of the population prefer lotteries inferred by nonzero bids, efforts to reduce decision error (e.g., with experience, expertise, feedback, time, reduced outcome variance, etc.) can only eliminate the winner's curse associated with positive bids for at most half the population. Consequently, one implication of this paper is that these efforts may have been more successful than previously recognized.

The ceiling effect and its magnitude are consistent with past efforts to reduce decision error. Researchers rarely find that even a simple majority of subjects avoid the winner's curse. For instance, in their best conditions for avoiding the winner's curse, Idson et al. (2003) find that with explicit training 39 percent of subjects bid zero and Charness and Levin (2005) find that with just two possible firm values (0 or 99) 49 percent of bids are zero.

The paper proceeds as follows. The next section presents the hypotheses. Section 3 provides the methods for Study 1 and Section 4 presents the results. The results support the main hypothesis that many subjects prefer positive bids. Section 5 hypothesizes that preferences for positive bids reflect either risk-seeking behavior (i.e. subjects prefer gambles with negative expected value) or that other attributes of the environment affect subject's utility in addition to the monetary outcome. Section 6 reports on a second study that provides strong support for the latter hypothesis and only weak support the risk-seeking hypothesis. Section 7 concludes.

II. Hypotheses

The persistence of the winner's curse despite numerous efforts to help people understand the decision error motivates the first hypothesis. Ball et al. (1991:17) argue, "our subjects failed to learn in an environment that has led virtually all audiences exposed to this experiment to predict learning within 20 trials." Five years later, Foremen and Murnighan (1996:178) conclude, "the accumulated findings suggest that avoiding the winner's curse in these problems is difficult or rare." If the best efforts persistently fail then either people still suffer from decision error or they have overcome decision error but prefer the lottery. Given the persistence of positive bids despite these diverse efforts, we hypothesize that there is a non-trivial proportion of the population who prefer the underlying lotteries associated with positive bids:

H1: *There is a non-trivial proportion of the population who prefer at least one or more of the underlying lotteries associated with positive bids in the Takeover task.*[5]

We do not argue there is no decision error or that preferences alone explain all positive bids in the Takeover task. Indeed, the fact that several manipulations have reduced the severity of the winner's curse indicates the presence of decision error in the absence of these manipulations. We thus also predict that subjects suffer from decision error in the Takeover task. The number of subjects who suffer from decision error will be reflected in the number of subjects whose inferred preferences in the Lottery task do not predict bids in the Takeover task:

H2: *There will be a non-trivial proportion of the population whose lottery choices will not predict their bidding behavior in the Takeover Task.*[6]

The first two hypotheses imply that people who prefer bidding 0 if not for decision error can avoid the winner's curse with training while others will make positive bids regardless of decision error. Thus, the first two hypotheses imply that training will have its greatest effect on people who reject all lotteries. A common training method to reduce decision error is learning (e.g., Ball at al. 1991 and Grosskopf et al. 2003). Thus, the third hypothesis is:

H3: *Subjects who suffer from decision error but reject all lotteries will be more likely to learn to avoid the winner's curse than subjects who accept one or more lotteries.*

[5] We do not predict a specific proportion since variations in design and subject pools can affect the outcome.
[6] See previous footnote.

A strict test of this hypothesis is that subjects who reject all lotteries will be more likely to learn to bid 0. Given the rarity of bidding 0 throughout the literature, a weaker test is that the subjects who reject all lotteries will lower their bids relative to other subjects.

III. Methods

Sixty-two subjects participated in four sessions. Each session consists of three financially motivated tasks: the Takeover task, the Lottery task and a 14-question test on the Takeover task. In two sessions the Takeover Task was first and the Lottery task second (N=32 subjects) and in two sessions the order was reversed (N=30 subjects). In all sessions the 14-question test was third. Subjects were endowed with a $5 show-up plus earnings received for the tasks. All sessions lasted less than one hour and average earnings were $22.50.

The instructions are presented in the appendix. The instructions for the Takeover task are modified from Ball et al. (1991) and Grosskopf et al. (2003). Subjects bid in the Takeover task 20 times using paper and pencil. For each round, the subject wrote a bid on his decision sheet, then the experimenter drew a chip (with replacement) from a container with the values 0, 1, …, 100. Each point has an exchange value of $0.10. The experimenter recorded the draw, whether the firm was acquired, and the profit or loss. This procedure was repeated 20 times. At the end of the session, one round was randomly chosen for each subject. The outcome of this round was added or subtracted to the subject's payoff. Similar to other studies wanting to prevent loss, subjects were endowed with an extra $10 for completing this task.

In the Lottery task, subjects were given 33 separate lotteries. For each lottery, subjects could either accept or reject it. At the end of the session, one of the 33 lotteries was randomly chosen for each subject. If the lottery was accepted, the experimenter drew a chip from a container with the values 0, 1, …, 100. The outcome was added or subtracted to the payoff for the subject. If the lottery was rejected, the task had no effect on their earnings. Similar to the Takeover task, to prevent losses subjects were endowed with an extra $10 for completing this task. The instructions refer to lotteries as “situations” to avoid any reference to gambling.

The 33 lotteries are objectively identical to the lotteries subjects obtain in the Takeover task for bids equal to 2, 5, 8, …, 92, 95 and 98. For example, the lottery corresponding to a bid of 2 has a payoff of -$0.20 if draw = 0, -$0.05 if draw = 1, $0.10 if draw = 2 and a payoff of $0 if draw = 3 to 100, each with probability 1/101. The appendix shows the decision sheet for the lottery corresponding to a bid of 50. We gave the lotteries in ascending (i.e., bids equal to 2, 5, 8, …) or descending (i.e., bids equal to 98, 95, 92, …) order. We never mention the relationship between the Lottery and Takeover; interestingly, no subject asked about the relationship.

The third task in each session asks subjects 14 questions about the Takeover task to assess their understanding. Subjects were paid $0.25 for each correct answer. The appendix shows these questions. The mean number of correct answers is 13.0 (standard deviation 1.9), indicating high *ex-post* understanding. A final survey collects data on academic outcomes and demographics.

IV. Results

Task order neither affects Takeover bids nor the number of lotteries accepted. Table 1 Section A shows mean bids and the percent of 0 bids across the two orders. Neither mean bids (t=0.36, p=.72; Kolmogrov-Smirnov non-parametric test (KS) D=.17, p=.66) nor the percent of subjects who bid 0 (t=0.96, p=.34) differ significantly across task order. Section B shows no significant difference across task order in the number of lotteries accepted (t=1.33, p=.18) or the percent of subjects who reject all lotteries (t=1.11, p=.27; KS: D=.22, p=.36). The number of lotteries accepted in the ascending (7.7) and descending (8.1) orders are also not statistically different (t=.19, KS: D=.15, p=.85). We thus collapse the analysis across task and lottery order.

The Takeover bids are similar to those reported in past studies. For instance, 6.5% (4/62) of the subjects bid 0 in all 20 rounds and only one other subject bid 0 (and only once). In comparison, Ball et al. (1991) report across 20 rounds that 7.2% (5/69) of their subjects bid 0. Further, 10%, 28%, 43% and 10% of bids are from 0 to 25, 25 to 50, 50 to 75 and 75 to 100, respectively. Similar to most studies, the largest number of bids is between 50 and 75.

The first hypothesis H1 states that a non-trivial proportion of the population prefers one or more of the lotteries corresponding to positive bids in the Takeover task. Figure 1 shows the percent of subjects by lotteries accepted. Subjects accept from 0 to 29 lotteries. Thirty-seven percent (23/62) accept no lotteries while 52% (32/62) accept a fairly even distribution from 1 to 19 lotteries and only 11% (7/62) accept more than 19 lotteries.

To test H1, we allow subjects to accept lotteries due to noise. Let e_{sl} be the probability subject s accepts lottery l although he intends to reject l and let e_{sl} be i.i.d. across lotteries. Also, let c_{sn} be the probability subject s accepts n or more of the 33 lotteries when he intends to reject all of them. We reject that a subject intends to reject each lottery with error e_{sl} at the 5% level (i.e., $c_{sn} = .05$) if the subject accepts at least n lotteries, where n depends on e_{sl} as follows:

	Reject w/95% confidence that this many or more lotteries are accepted							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
If e_{sl} is less than or equal to this value:	0.16%	1.08%	2.52%	4.25%	6.16%	8.24%	10.41%	12.68%
Number of Subjects who we:								
can reject intend to accept all lotteries	39	37	32	30	30	30	27	25
cannot reject intend to accept all lotteries	23	25	30	32	32	32	35	37

The insert shows that with $e_{sl} = 0.16\%$ we reject the hypothesis with 95% confidence that a subject who accepts one or more lotteries intended to reject all lotteries. While this error rate may be reasonable since making an error such as circling the wrong choice seems unlikely, it may underestimate other errors such as avoiding effort in decision-making. If we assume e_{sl} is between 2.52% and 8.24%, then we reject with 95% confidence that any subject who accepts six or more lotteries intended to reject all lotteries and we cannot reject that any subject who accepts three or fewer lotteries intended to reject all lotteries. The data provide empirical motivation for this division; no subject accepts 4 or 5 lotteries, thus separating those who intend to reject all lotteries (accepting 0-3 lotteries) from those who do not intend to reject all lotteries (accepting 6 or more).[7]

The data provide strong support for hypothesis H1. We reject that either 63% (39/62 with e_{sl} < 0.16%) or 48% (30/62 with e_{sl} between 2.52% and 8.24%) of subjects intended to reject all the lotteries. Even with an error rate e_{sl} as high as 12.68% we reject that 40% (25/62) of the subjects intended to reject all the lotteries. Thus, supporting H1, we find that a non-trivial proportion of the subjects prefer some of the lotteries implied by nonzero bids in the Takeover task.

The second hypothesis H2 states that a non-trivial proportion of the population will make decision errors such that their lottery choices will not predict their Takeover bids. We test this hypothesis at the aggregate and individual level. At both levels, the data support this hypothesis.

At the aggregate level, we examine whether subjects who intend to reject all lotteries and subjects who intend to accept one or more lotteries bid differently in the Takeover task. Table 2 presents this aggregate analysis. Treating each subject as an independent observation, we examine first and last bids, mean and median bids across all 20 rounds, and mean bids across the first and last five rounds. We compare bids between subjects who did and did not intend to reject all lotteries using the two definitions of rejection intentions ($e_{sl} < 0.16\%$ or $2.52 < e_{sl} < 8.24\%$).

Table 2 shows no significant differences in bids between subjects who intend to reject all lotteries and subjects who intend to accept one or more lotteries. The first bid, mean of the first five bids and mean and median bids across all 20 rounds differ by less than five. The last bid and mean of the last five bids differ slightly more, but are still not significantly different across subjects who do and do not intend to accept all the lotteries ($p > .20$ in all cases).

Figure 2 offers visual support that bids across the two groups do not differ. Figure 2 orders subjects from lowest to highest mean bid on the horizontal axis and shows their mean bids on the

[7] Defining n = 1, 2, 3, …, 15 does not affect our results qualitatively, where n equals the minimum number of lotteries accepted so that we reject that these subjects intended to reject all lotteries.

vertical axis. With the exception of the four subjects who bid 0 in all rounds of the Takeover task, the two group's mean bids from lowest to highest are nearly identical (KS: D=.17, p=.69). Thus, at the aggregate level, there is no statistical evidence that behavior in the lottery task helps explain bidding behavior in the Takeover task.

At the individual level, we use preferences inferred from lottery choices to identify decision error in the Takeover task. First, we infer that subjects who reject all lotteries prefer bidding 0 in the Takeover task. While only four subjects who reject all lotteries bid 0 in all rounds, 19 subjects who reject all lotteries make positive bids in all rounds. These 19 subjects' bids are not predicted by their inferred preferences, thus we conclude decision error explains their bids.

For subjects who accept lotteries, nonzero bids in the Takeover task may be explained by either decision error or preferences. To examine if these bids reflect preferences, we use lotteries accepted to define preferences, and then test whether more bids are made that are predicted by these preferences than would occur by random chance. Before proceeding, we note that subjects do not accept lotteries randomly, but prefer specific lotteries. Figure 3 shows that the most common lotteries accepted correspond to bids from 26 to 80. Regressions (not shown) confirm that the mid-range lotteries are accepted significantly more often than lotteries at the extremes.

We now test whether the lotteries subjects accept predict behavior in the Takeover task. To proceed, we assume since lotteries are equally spaced in increments of 3 that if a subject accepts a lottery corresponding to bid j he prefers bids on [j-1.5, j+1.5] to bidding 0 and if he rejects the lottery corresponding to bid j he prefers bidding 0 to bids on [j-1.5, j+1.5]. If a subject accepts n lotteries, then he prefers a range of 3n bids (not necessarily contiguous) to bidding 0. However, if the subject bids randomly from the uniform distribution on [0, 100], then there is a 3n/100 chance each bid falls in his preferred range.[8] We can now calculate the likelihood (using the binomial distribution) that at least m of his 20 Takeover bids are in his preferred range.

For example, consider subject 101 who accepted six lotteries corresponding to bids 42, 45, 48, 51, 54 and 57 and rejected all other lotteries. We thus assume he prefers bids on [40.5, 58.5] to bidding 0 and prefers bidding 0 to bids on [0, 40.5) and (58.5, 100]. There is an 18 percent chance each bid is in [40.5, 58.5] if bids are randomly drawn from the uniform distribution on [0, 100]. Over 20 bids, the likelihood that at least one bid is in this range is 98.1% and the likelihood that at least 2, 3, 4, 5, 6, 7, 8, 9 and 10 bids are in this range, respectively, are 89.8%, 72.5%, 49.7%, 28.5$, 13.6%, 6.4%, 1.8%, 0.5% and 0.1%. In fact, subject 101 made 10 bids in the predicted range. Thus, we reject at the p=.001 level that he bid randomly in the Takeover task and cannot reject that he bid consistently with his preferences inferred from the lotteries he accepted. In other words, we reject that this subject suffered from decision error since his bids in the Takeover task are predicted by his inferred preferences in the Lottery task.

There are 39 subjects who made at least one positive bid. Among them, we reject with 95% confidence (p=.05) that 23 bid randomly and we cannot reject that the other 16 bid randomly. Thus, assuming lottery choices reflect subjects' preferences, 16 of these 39 subjects suffer from decision error in the Takeover task while the other 23 bid consistently with their preferences inferred from the Lottery task. This subject level analysis classifies subjects as following manner:

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		Avoid decision error in Takeover	
		Yes	No
Based on Lottery Choices:	Yes	23	16
Prefer at least one positive bid to bidding 0	No	4	19

[8] If the subject accepts the lottery corresponding to a bid of 2 we assume the range is from 0 to 3.5 and if he accepts a lottery corresponding to a bid of 98 we assume the range is from 96.5 to 100.

In sum, 56% [(19+16)/62] of the subjects' inferred preferences in the Lottery task do not predict their Takeover behavior and 44% [4+23] of the subjects' inferred preferences in the Lottery task predict their Takeover behavior. Thus, a non-trivial proportion of the subjects, 56%, suffer from decision error in the Takeover task, consistent with the second hypothesis.

The third hypothesis H3 states that subjects who suffer from decision error but reject all lotteries will be more likely to learn to avoid the winner's curse. We find mixed evidence for this hypothesis. In the strict sense of avoiding the winner's curse by bidding 0, we find no support for this hypothesis; not one of the 19 subjects who rejected all lotteries and made at least one positive bid learned to bid 0 even once over the 20 rounds of the Takeover task.

Compared to subjects who intend to accept lotteries, however, we find support for the weaker hypothesis that subjects who intend to reject all lotteries learn to make relatively lower bids. Table 2 shows that subjects who intend to accept no lotteries make lower bids from the first to last rounds while subjects who intend to accept at least one lottery make higher bids. To more formally test hypothesis H3, we estimate the following censored Tobit panel regression model:

(1) $bid_{i,r} = a + ßReject\_All_i + dr + ?Reject\_All\_by\_r_i + e_i + ?_{ir}$

where $bid_{i,r}$ is subject i's bid in round r, $Reject\_All_i$ is a dummy for subject i's intent to reject all lotteries (equals 1 if true), r equals round (1 to 20), Reject_All_by_r is the interaction of the two variables and e_i is subject specific error. Hypothesis H3 predicts the interaction term ? will be negative. Table 3 reports parameter estimates and random effect errors. We estimate regressions for both definitions of intentions ($e_{sl} < 0.16\%$ or $2.52 < e_{sl} < 8.24\%$). We exclude subjects who bid the same amount (four bid 0, one bid 60, one bid 75 and one bid 100) every round.

Columns 1 and 4 estimate equation 1 with no covariates. These estimates indicate that bids among subjects who intend to reject all lotteries decreases by 0.6 relative to subjects who intend to accept at least one lottery. This relative decrease is significant ($p<.01$). Adding task order (models 2 and 5) has no effect on the magnitude or significance of this relative decrease. Likewise, adding controls for gender, age, SAT score and number of questions correctly answered on the third task has no effect on this relative decrease. Thus, the data support the hypothesis that subjects who intend to reject all lotteries are relatively more likely to make lower bids as they gain experience. This behavior is consistent with subjects learning to overcome decision error; subjects who intend to reject all lotteries are more likely to move closer to bidding 0 as they gain experience.

V. Preferences for Positive Bids

Study 1 provides strong support for hypotheses H1 and H2 and some support for H3. The data indicate that a limited number of subjects can be trained to avoid the winner's curse. The limit is the proportion of subjects who accept lotteries. Study 1 establishes that a non-trivial proportion of subjects *prefer* the lotteries associated with positive bids in the Takeover task.

We now discuss these inferred preferences. One possibility is that people are risk-seeking and so prefer lotteries with negative expected value. The second possibility is that the utility received from accepting or rejecting lotteries includes more than the monetary payoff distribution. For instance, subjects may obtain utility from (i) active participation, (ii) excitement of the draw, (iii) pleasing the researchers (e.g., a demand effect), (iv) ignoring financial consequences, (v) trying different strategies, (vi) minimizing cognitive effort, and so forth. Many aspects of utility derived from non-monetary factors have been studied in other contexts. The idea is that preferences cannot be looked at in isolation, but rather they are imbedded in the broader environment of the task (Rabin 1993 makes this point in the context of games). This idea has been demonstrated in many contexts. For instance, studies show that rejecting ultimatum game offers depends on not only the amount of the offer, but also who made the offer (Blount 1995) and what alternative offers were available (Bolton et al. 1998). Kahneman and Tversky (1979) and Tversky and Kahneman (1986) show that the framing of problems affects behavior. Huber, Payne and Puto (1982) show that adding theoretically irrelevant (dominated) choices can also alter decision-making. Ku et al. (2005) argue and demonstrate that bidders who suffer from the winner's curse may suffer from competitive arousal, in essence gaining value from the competition to win.

The next section presents a second study to distinguish between risk-seeking preferences and preferences being embedded in the broader context. If subjects accept lotteries due only to risk-seeking preferences, then the ceiling effect for overcoming the winner's curse will be robust to the experimental context and will not be affected by the manipulation in this second study. Yet, if subjects accept lotteries because of the context, then the ceiling is not constant and there is room to further reduce the percent of subjects who prefer the lotteries associated with positive bids.

To separate the two explanations for subjects accepting lotteries, we manipulate the lottery choices from Study 1 in two ways. First, we include additional lotteries that have positive expected value. This manipulation may reduce the number of corresponding Takeover task lotteries that subjects accept for several reasons. For instance, the positive expected value lotteries may provide a reference point, and consequently cause subjects to place less value on the Takeover lotteries. Further, if subjects receive utility from "accepting something," then the positive expected value lotteries can provide this utility and thus reduce the utility of accepting the negative expected value lotteries.

We also manipulate the context by adding four summary statistics for each lottery: maximum positive outcome, maximum negative outcome, number of positive outcomes and number of negative outcomes. This information is trivial to observe on the decision sheets. However, for subjects who prefer not even expending effort to consider these statistics, this manipulation may make it cost effective to no longer ignore them. Combining the two manipulations, we test the following hypotheses:

H4a: *Accepting btteries corresponding to positive bids in the Takeover task can be explained by risk seeking preferences.*

H4b: *Accepting lotteries corresponding to the positive bids in the Takeover task can be explained by preferences that include utility from non-monetary aspects of the environment in addition to the monetary distribution of the lotteries.*

VI. Separating Risk-Seeking Preferences and Context

V.1: Methods:

Study 2 has only one financially motivated task. This task is nearly identical to the Study 1 Lottery task. The identical instructions are used, with the addition of the following:

> "For each situation, we will also provide some summary information. This information will consist of the *Maximum Payoff* possible across all outcomes, the *Minimum Payoff* possible across all outcomes, the *Number of Positive Outcomes* that are possible and the *Number of Negative Outcomes* that are possible. This information is provided for you convenience and you may use it or not use is as you wish."

Besides summary information, we add a *matched* lottery to each lottery in Study 1 for a total of 66 lotteries. Each matched lottery is identical to one of the Study 1 lotteries except all outcomes are multiplied by -1. For instance, the matched lottery to the lottery that corresponded to a bid of 2 has a payoff of \$0.20 if the draw is 0, a payoff of \$0.05 if the draw is 1, a payoff of -\$0.10 if the draw is 2 and a payoff of \$0 for the remaining outcomes. For convenience, we refer to the new lotteries as *positive* and the original lotteries as *negative.*

Similar to Study 1, we have two orders for the lotteries. In both orders, the negative original lottery was always preceded by its matched positive lottery. In the ascending order (N=15 subjects), the first pair of lotteries corresponds to a bid of 2 in the Takeover task, the second pair corresponds to a bid of 5, and so forth. In the descending order (N=14 subjects), the first pair corresponds to a bid of 98, the second pair corresponds to a bid of 95, and so forth. After the Lottery task, subjects completed the same survey given in Study 1. Also identical, after the survey, one lottery was chosen for each subject and the outcome of the lottery was added to or subtracted from the subject's pay. Subjects were again given $10 for the task so that there was no chance that they could lose money. Twenty-nine subjects participated in Study 2. Subjects received a $5 show up fee and earned on average $16 for the 30 minute experiment.

V.2: Results

Lottery order has no significant effect on the mean number of negative lotteries subjects accept (t=1.02, p=.31) or the proportion of subjects who reject all negative lotteries (t=0.70, p=.49), so we collapse the analysis across order. On average, subjects accept 28.7 of the positive lotteries and 52% (15/29) of the subjects accept all 33 of them.

Hypothesis H4b predicts that subjects will accept fewer negative lotteries in Study 2 than Study 1. We find strong support for this hypothesis (Figure 4 shows the percent of subjects by the number of negative lotteries accepted for each study). Seventy-two percent of Study 2 subjects reject all negative lotteries compared to only 37 percent of Study 1 subjects, hence, we reject that the same number of subjects reject all lotteries (t=2.07, p=.042). We also reject that the same percent of subjects reject less than two, three, four or five lotteries (p<.05 in all cases). Thus, allowing for a reasonable amount of noise in intention to reject lotteries, we reject that the same number of subjects intend to reject all lotteries across the two studies. Further, on average subjects in Study 2 only accept 2.83 negative lotteries whereas in Study 1 subjects accept 7.92. We thus also reject that subjects accept the same number of lotteries in each study (t=2.79, p=.006; KS:D=0.36, p=.007). These results strongly support hypothesis H4b that accepting lotteries corresponding to nonzero bids in the Takeover task can be at least somewhat explained by preferences that are affected by the environment beyond the lottery's monetary distribution.

A strong test of hypothesis H4a is that the distribution of subjects that accept the negative lotteries will not differ across the two studies. The data does not support this test of hypothesis

H4a since many more subjects (72 percent versus 37 percent) reject all lotteries in Study 2. However, a weak test of hypothesis H4a is that significantly more than 0 subjects prefer the negative lotteries in Study 2. We find support for this weaker test. Twenty-eight 28 percent (8/29) of the subjects accept at least one negative lottery and 21 percent (6/29) accept at least six negative lotteries. Thus, there remains support for hypothesis H4a that some of the subjects may accept lotteries corresponding to nonzero bids in the Takeover task due to risk seeking attitudes.

In sum, Study 2 shows that one reason many subjects accept lotteries corresponding to positive bids in the Takeover task is due to the non-monetary aspects of the environment. Manipulating the context, Study 2 shows that introducing comparably favorable lotteries and providing summary information significantly reduces the number of subjects who prefer the negative expected value gambles. Yet, Study 2 also shows that even after a strong manipulation there remains over 1/5 of the population who prefer many (at least 6) of these lotteries. Study 2 thus shows that the ceiling effect of approximately 1/2 to 2/3 of the population who prefer positive bids found in Study 1 is not universal. Instead, the ceiling depends on the context but may still be somewhat limited by risk seeking preferences.

VII Conclusion

Study 1 demonstrates that positive bids in the Takeover task may not only be explained by decision error resulting in the winner's curse, but also by preference for positive bids. Study 1 also finds that just over half (56%) the subjects make decision errors and approximately half to two-thirds prefer positive bids. Study 2 shows that preferences for lotteries associated with the Takeover task are affected by factors other than the monetary distribution of the lotteries.

The results of Study 1 offer a more positive interpretation on past efforts to reduce decision error than previously given. Past studies, implicitly assuming that 100 percent of subjects would prefer bidding 0 if not for decision error, may have seemed somewhat discouraging in reducing the winner's curse since less than 50 percent of any population overcome the curse. For instance, Idson et al. (2003) find in their most successful effort that only 39 percent of their subjects overcome the curse. With a benchmark of 100 percent, this result may not seem overly promising. Yet, with a benchmark of 50 percent (the rest preferring positive bids), this effort successfully eliminated decision error among almost 80 percent (39/50) of the maximum possible.[9] Thus, past efforts to reduce decision error have been more successful than realized.

From a practical standpoint, the reason for understanding the winner's curse and finding methods to overcome decision error is to improve market designs to aid professionals and novices to avoid the curse in important contexts.[10] Thus, this paper reinforces the importance of understanding people's preferences in addition to the market context in order to provide the optimal advice. For instance, while some people surely suffer decision error and fail to appreciate the negative expected value of casino gambling and state run lotteries, other people just as surely receive utility from these activities besides monetary payoffs that this extra utility may outweigh the negative expected monetary value. Thus the optimal advice depends on preferences including, but not limited to, the monetary distribution.

[9] Study 2 shows that the benchmark depends on the context of the Takeover. With summary information and matched positive and negative lotteries, the benchmark may be somewhat higher. However, compared to past studies, the benchmark in Study 1 is more appropriate as its context more closely matches many of these past studies.

[10] However, since bidding 0 guarantees the inefficient outcome that the seller keeps the firm (see footnote 2), the advice to bidders and the advice to policy-makers may differ.

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Table 1: Order Effects on Lottery Decisions and Takeover Bids

	Order		
Task 1	Takeover	Lotteries	Statistical Tests for differences
Task 2	Lotteries	Takeover	
A. Takeover Game Results			
Mean (SD) Bid	46.7 (20.2)	48.5 (18.6)	t=0.36, p=.72 KS:D=.17, p=66
Percent who always Bid 0	9% (3/32)	3% (1/30)	t=.96, p=.34
Mean (SD) Bid Excluding 0 Bids	51.5 (13.8)	50.2 (16.4)	t=34, p=73 KS:D=.21,p=.47
B. Lottery Results			
Mean (SD) Lotteries Taken	6.47 (8.35)	9.47 (9.35)	t=1.33 p=.18 KSTest D=.22 p=.36
Percent Reject All Lotteries	44% (14/32)	30% (9/30)	t=1.11, p=.27
N	32	30	

Table 2: Comparisons of bidding behavior conditional on inferred Intention to accept any lotteries

	e_l = 0.16%			2.52% < e_l = 8.24%		
	Intended no lotteries	Intended some lotteries	Tests	Intended no lotteries	Intended some lotteries	Tests
N	23	39		32	30	
First Bid (SD)	47.3 (26.8)	45.1 (14.7)	t=.43, p=.67 KS:D=.22,p=.40	45.7 (23.8)	46.1 (14.9)	t=.08, p=.94 KS:D=.16,p=78
Mean (SD) of all 20 Bids	48.8 (14.2)	45.4 (25.9)	t=.63,p=.53 KS:D=.17,p=.69	49.4 (14.0)	45.9 (23.3)	t=.71,p=.48 KS:D=.18,p=.58
Median (SD) of all 20 Bids	44.9 (26.5)	49.0 (16.3)	t=.76, p=45 KS:D=.19,p=.56	45.5 (24.3)	49.6 (15.8)	t=.77, p=.44 KS:D=.18,p=.60
Last Bid (SD)	48.5 (32.9)	54.1 (27.6)	t=.72, p=47 KS:D=.22,p=.40	49.9 (33.0)	54.3 (25.7)	t=.58, p=.56 KS:D=.19,p=57
Mean (SD) of First Five Bids	46.9 (25.6)	46.7 (14.1)	t=.05, p=.96 KS:D=.23,p=.31	46.8 (14.7)	46.7 (22.5)	t=.03, p=.98 KS:D=..15,p=79
Mean (SD) of Last Five Bids	43.1 (26.4)	49.7 (19.6)	t=1.12, p=.27 KS:D=.24,p=.30	43.8 (25.4)	50.9 (18.5)	t=1.24, p=.22 KS:D=.18,p=.60

KS = Kolmogrov-Smirnov difference in cumulative distribution test (D=greatest difference)

Table 3: Determinants of Bids in the Takeover Task

	e_l = 0.16%			2.52% < e_l = 8.24%		
Model	1	2	3	4	5	6
Constant	46.81*** (1.46)	40.91*** (1.44)	41.46*** (10.43)	46.28*** (1.77)	40.14*** (1.57)	40.72*** (11.87)
Round (=1-20)	0.22** (0.10)	0.22** (0.10)	0.22** (0.10)	0.33*** (0.11)	0.33*** (0.11)	0.33*** (0.11)
Intended To Take No Lotteries	8.32*** (2.60)	6.56** (2.73)	4.88* (2.55)	6.49*** (2.52)	5.24** (2.52)	2.17 (2.65)
Round * Intended To Take 0 Lotteries	**-0.60*** ((0.18)**	**-0.60*** ((0.18)**	**-0.59*** ((0.18)**	**-0.61*** (0.17)**	**-0.61*** (0.17)**	**-0.61*** (0.17)**
Takeover Game First		7.88*** (1.49)	4.97** (2.06)		7.94*** (1.49)	8.28*** (1.49)
Female			-1.10 (2.04)			0.32 (1.49)
Age			-0.17 (0.40)			-0.60* (0.32)
SAT			0.017** (0.007)			0.003 (0.006)
Correct on Final Quiz			0.61* (0.34)			0.53 (0.38)
N	1100	1100	1100	1100	1100	1100
Log-Likelihood	-4617.51	-4616.06	-4615.16	-4616.81	-4614.52	-4612.40

Tobit Panel Regressions with Random Effects
Dependent Variable = $bid_{i,r}$ (see text equation 1)
*=p<.10, **=p<.05, ***=p<.01

Figure 1: Distribution of Lotteries Accepted

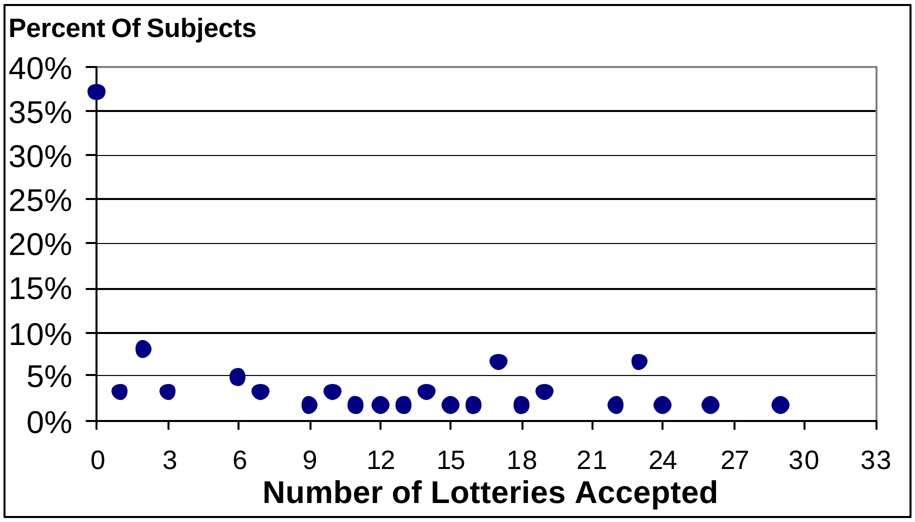


Figure 2: Distribution of Mean Bids by Number of Lotteries Accepted

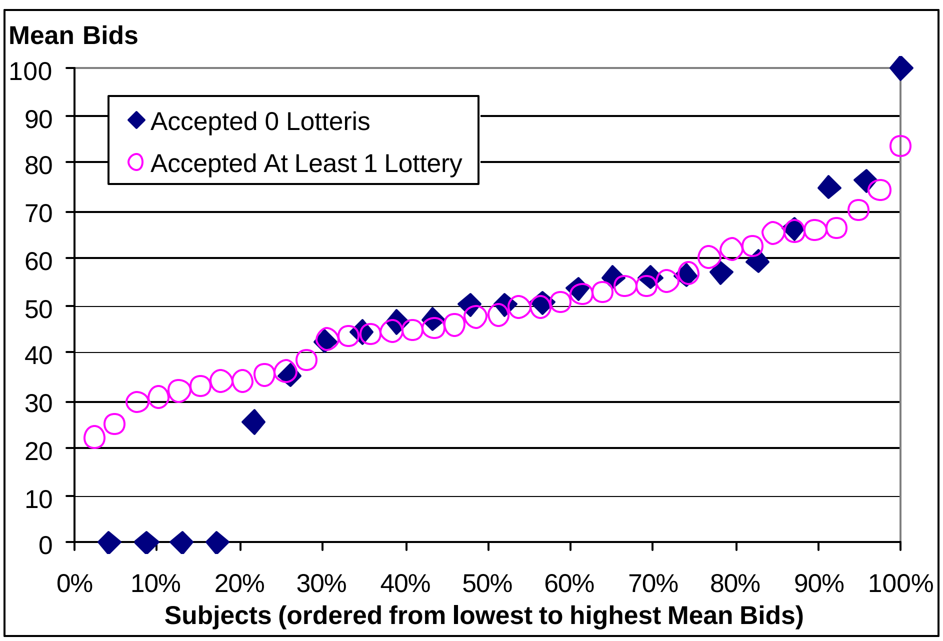


Figure 3: Percent Each Lottery Accepted by Lottery Takers

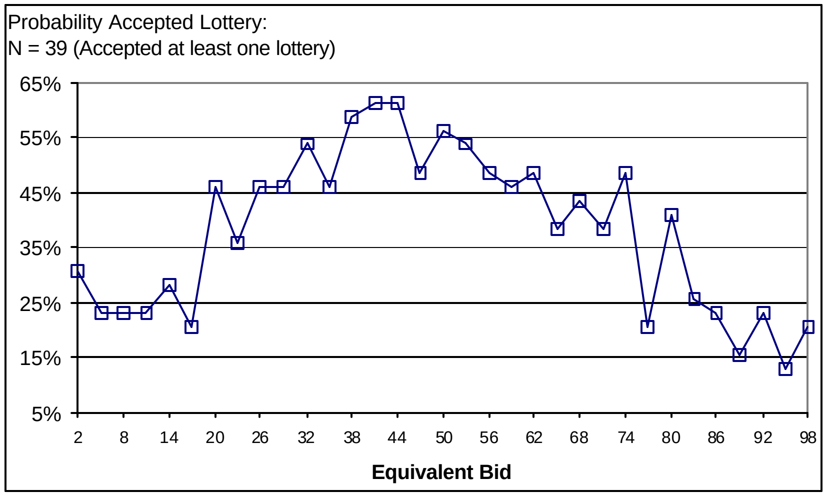
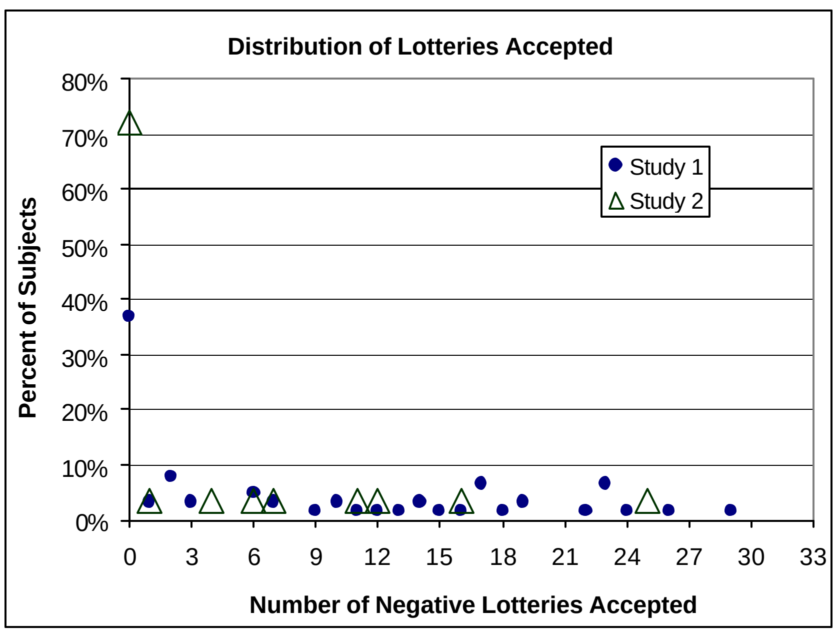


Figure 4: Distribution of Lotteries Accepted by Study



Appendix: Instructions

(Order: Lottery First, Takeover Second)

General Introduction

Thank you for participating. You will receive $5.00, in cash, at the end of today's session for participation. In addition, you can receive more money depending on the decisions you make in three distinct tasks. We will add up how much money you earn from each task and add it to the $5.00 to determine your final payoff for participation. How you can receive additional money for each task is explained below.

All of your responses will be anonymous; no one will ever know what choices you make. Once you complete the three tasks, you will be given a very short survey to complete today's experiment.

If you have questions at any point regarding anything related to today's tasks, please raise your hand and someone will come over to answer your questions. From this point on no communications with anyone is allowed.

Task 1:

In this task, you will make several accept-decline choices. If you make a decision (either to accept or decline) for all the situations, then you will receive an extra $10 for your participation today. Receiving this $10 does not in any way depend on how many situations you decide to accept or decline: Regardless of whether you accept all decisions, decline all decisions, or accept some and decline the rest, you will receive this extra $10 as long as you make a decision for each situation.

Each situation will have 101 possible outcomes.

If you decline the situation, then you do not receive any outcome: that is, nothing will happen to change your earnings.

If you accept the situation, you will receive one of the possible outcomes. To determine which outcome you will receive, we will have 101 chips in a jar. Each chip will be labeled uniquely to represent each of the possible 101 outcomes so that there will be exactly one chip in the jar for each outcome. The chips will be numbered 0, 1, 2, and so on up to 100. To determine which outcome you will receive, we will randomly draw one of the chips. Since there will be exactly one chip for each outcome, each of the 101 outcomes will be equally likely to be drawn. Thus, if you accept the situation, then your pay for today will increase or decrease based on the randomly chosen outcome and if you decline the situation, your pay for today will not be changed. We now provide two examples:

Example Situation 1

Outcome	Payoff	Outcome	Payoff	Outcome	Payoff	Outcome	Payoff
0	-$3.00	26	$0.00	52	$0.00	78	$0.00
1	-$0.25	27	$0.00	53	$0.00	79	$0.00
2	$4.20	28	$0.00	54	$0.00	80	$0.00
3	$0.00	29	$0.00	55	$0.00	81	$0.00
4	$0.00	30	$0.00	56	$0.00	82	$0.00
5	$0.00	31	$0.00	57	$0.00	83	$0.00
6	$0.00	32	$0.00	58	$0.00	84	$0.00
7	$0.00	33	$0.00	59	$0.00	85	$0.00
8	$0.00	34	$0.00	60	$0.00	86	$0.00
9	$0.00	35	$0.00	61	$0.00	87	$0.00
10	$0.00	36	$0.00	62	$0.00	88	$0.00
11	$0.00	37	$0.00	63	$0.00	89	$0.00
12	$0.00	38	$0.00	64	$0.00	90	$0.00
13	$0.00	39	$0.00	65	$0.00	91	$0.00
14	$0.00	40	$0.00	66	$0.00	92	$0.00
15	$0.00	41	$0.00	67	$0.00	93	$0.00
16	$0.00	42	$0.00	68	$0.00	94	$0.00
17	$0.00	43	$0.00	69	$0.00	95	$0.00
18	$0.00	44	$0.00	70	$0.00	96	$0.00
19	$0.00	45	$0.00	71	$0.00	97	$0.00
20	$0.00	46	$0.00	72	$0.00	98	$0.00
21	$0.00	47	$0.00	73	$0.00	99	$0.00
22	$0.00	48	$0.00	74	$0.00	100	$0.00
23	$0.00	49	$0.00	75	$0.00		
24	$0.00	50	$0.00	76	$0.00		
25	$0.00	51	$0.00	77	$0.00		

CIRCLE ONE CHOICE: **I Accept** **I Decline**

In Example Situation 1, suppose you decide to accept. In this case, and without looking, we would randomly choose one of the 101 chips, so all outcomes are equally likely. If we randomly choose outcome 0, then $3.00 would be *subtracted* from your earnings. If we randomly choose outcome 1, then $0.25 would be *subtracted* from your earnings. If we randomly choose outcome 2, then $4.20 would be *added* to your earnings. And if we randomly choose any outcome from 3 to 100, then your earnings *would not change*. Finally, if you decided not to accept this situation, your earnings would be unaffected.

Example Situation 2

Outcome	Payoff	Outcome	Payoff	Outcome	Payoff	Outcome	Payoff
0	-$8.00	26	$0.00	52	$0.00	78	$0.00
1	-$6.00	27	$0.00	53	$0.00	79	$0.00
2	-$4.00	28	$0.00	54	$0.00	80	$0.00
3	-$4.00	29	$0.00	55	$0.00	81	$0.00
4	$3.00	30	$0.00	56	$0.00	82	$0.00
5	$3.00	31	$0.00	57	$0.00	83	$0.00
6	$3.00	32	$0.00	58	$0.00	84	$0.00
7	$3.00	33	$0.00	59	$0.00	85	$0.00
8	$3.00	34	$0.00	60	$0.00	86	$0.00
9	$3.00	35	$0.00	61	$0.00	87	$0.00
10	$3.00	36	$0.00	62	$0.00	88	$0.00
11	$3.00	37	$0.00	63	$0.00	89	$0.00
12	$3.00	38	$0.00	64	$0.00	90	$0.00
13	$0.00	39	$0.00	65	$0.00	91	$0.00
14	$0.00	40	$0.00	66	$0.00	92	$0.00
15	$0.00	41	$0.00	67	$0.00	93	$0.00
16	$0.00	42	$0.00	68	$0.00	94	$0.00
17	$0.00	43	$0.00	69	$0.00	95	$0.00
18	$0.00	44	$0.00	70	$0.00	96	$0.00
19	$0.00	45	$0.00	71	$0.00	97	$0.00
20	$0.00	46	$0.00	72	$0.00	98	$0.00
21	$0.00	47	$0.00	73	$0.00	99	$0.00
22	$0.00	48	$0.00	74	$0.00	100	$0.00
23	$0.00	49	$0.00	75	$0.00		
24	$0.00	50	$0.00	76	$0.00		
25	$0.00	51	$0.00	77	$0.00		

CIRCLE ONE CHOICE: **I Accept** **I Decline**

In Example Situation 2, suppose you decide to accept. In this case, and without looking, we would randomly choose one of the 101 chips, so all outcomes are equally likely. If we randomly choose outcome 0, then $8.00 would be *subtracted* from your earnings. If we randomly choose outcome 1, then $6.00 would be *subtracted* from your earnings. If we randomly choose outcomes 2 or 3, then $4.00 would be *subtracted* from your earnings. If we randomly choose any of the outcomes 4 through 12 then $3.00 would be *added* to your earnings. And if we randomly choose any outcome from 13 to 100, then your earnings *would not change*. Finally, if you decided not to accept this situation, your earnings would be unaffected.

We will proceed as follows. We will give you many situations. For each one you may either accept or decline. You may accept or decline as many or as few situations as you wish. *Once we have completed all tasks and the survey, we will then come back to this task and randomly choose* <u>*one*</u> *of the situations*. If you declined the randomly chosen situation, then your pay for today will not be affected by this task. If you accepted the randomly chosen situation, then we will determine the outcome of the task, and thus how much your pay is increased or decreased as a result.

Recall also that no matter whether you decide to accept or decline any situations you will receive $10 for this task as long as you make a decision (either accept or decline) for all the situations presented to you.

Note that there are no right answers and no wrong answers for this task; we only wish to see what choices you wish to make.

If you have any questions, please let the experimenter know at this point. Otherwise please let the experimenter know that you are ready to begin and he/she will provide you with the actual situations.

Example: Decision Sheet for Lottery that is equivalent to bidding 50:

ID: _______

Situation 17

Outcome	Payoff	Outcome	Payoff	Outcome	Payoff	Outcome	Payoff
0	-$5.00	26	-$1.10	52	$0.00	78	$0.00
1	-$4.85	27	-$0.95	53	$0.00	79	$0.00
2	-$4.70	28	-$0.80	54	$0.00	80	$0.00
3	-$4.55	29	-$0.65	55	$0.00	81	$0.00
4	-$4.40	30	-$0.50	56	$0.00	82	$0.00
5	-$4.25	31	-$0.35	57	$0.00	83	$0.00
6	-$4.10	32	-$0.20	58	$0.00	84	$0.00
7	-$3.95	33	-$0.05	59	$0.00	85	$0.00
8	-$3.80	34	$0.10	60	$0.00	86	$0.00
9	-$3.65	35	$0.25	61	$0.00	87	$0.00
10	-$3.50	36	$0.40	62	$0.00	88	$0.00
11	-$3.35	37	$0.55	63	$0.00	89	$0.00
12	-$3.20	38	$0.70	64	$0.00	90	$0.00
13	-$3.05	39	$0.85	65	$0.00	91	$0.00
14	-$2.90	40	$1.00	66	$0.00	92	$0.00
15	-$2.75	41	$1.15	67	$0.00	93	$0.00
16	-$2.60	42	$1.30	68	$0.00	94	$0.00
17	-$2.45	43	$1.45	69	$0.00	95	$0.00
18	-$2.30	44	$1.60	70	$0.00	96	$0.00
19	-$2.15	45	$1.75	71	$0.00	97	$0.00
20	-$2.00	46	$1.90	72	$0.00	98	$0.00
21	-$1.85	47	$2.05	73	$0.00	99	$0.00
22	-$1.70	48	$2.20	74	$0.00	100	$0.00
23	-$1.55	49	$2.35	75	$0.00		
24	-$1.40	50	$2.50	76	$0.00		
25	-$1.25	51	$0.00	77	$0.00		

CIRCLE ONE CHOICE: **I Accept I Decline**

Task 2:

Throughout the instructions, we highlight the most critical points by putting them in ***italics****.*

The experiment consists of 20 trials. In each trial round you will face the following general decision problem:

You will represent Company A (the potential acquirer), which is currently considering acquiring Company T (the target). You plan to pay in cash for 100% of Company T's shares but are unsure how high a price to offer. The main complication is this: the value of Company T depends directly on the outcome of a major oil exploration project it is currently undertaking. Depending on the success of the exploration, the company under current management will be worth either 0 or 1 or 2 or 3 or 4 and so on up to 100 points per share and all possible values are equally likely:

All share values between 0 points and 100 points are equally likely.

By all estimates, the company will be worth considerately more in the hands of Company A (you) than under current management. In fact, the company will be worth 50 percent more under the management of A (you) than under Company T. For instance, if the exploration project generates a 50 points per share value under current management, then the value under Company A (you) is 75 points per share (50 * 1.5), if the project generates a 100 points per share value under current management, then the value under Company A (you) is 150 points/share (100 * 1.5), if the company is worth 0 points per share under current management then it is also worth 0 points per share under Company A (you), and so on. The attached table (Table 1) lists all the possible values.

The value to Company A (you) equals 1.5 times the value under current management. See Table 1 for a list of values that the company is worth to the Acquiring firm (you) for each corresponding value that is worth to the Target Firm.

The board of directors of Company A has asked you to determine the price they should offer for Company T's shares. **This offer must be made now, before you know the outcome of the exploration project is known to you**. However, company T will know the outcome of the exploration project before it decides whether to accept or reject your bid.

When you, as Company A, make your bid, you will not know the results of the exploration. However, when Company T decides to accept or reject your bid, it will know the results of the exploration.

Company T will accept any bid that is greater than, or equal to, the (per share) value of the company under current management, and it will reject any bid below its value. Thus, if you offer 60 points per share, for example, Company T will accept if the value of the company to Company T is anything less than or equal to 60 points, and will reject if the value of the company to Company T is greater than 60 points..

You will takeover Company T if your bid is higher than or equal to the value under current management. You will not takeover Company T if your bid is less than the value under current management.

In this task, we want to know how much you (as Company A) would like to bid for Company T?

As the representative of Company A, you are deliberating over the price to bid in the range of 0 points per share to 100 points per share. Your bid should be expressed in integer values (that is, values of 0, 1, 2, 3, 4, and so on up to 100).

You will have altogether 20 separate trials to bid on Company T.

For each trial, you must decide how much you wish to bid from 0 to 100 points. We will record your bid on the attached record sheet. Once you have made your bid, we will draw one chip out of a jar. Each chip will have an integer number from 0 to 100 written on it. Every number from 0 to 100 will be written on one chip only, thus every value from 0 to 100 will be equally likely to be drawn. The value on the chip drawn will represent the value to Company T under current management. We will then record the value to you, which will be 1.5 times the value under current management. We will also record the profit or loss that you made for your bid, which will be the value of the firm to you minus your bid. Last, we will replace the chip in the jar so that all the chips will be in the jar for the next bid you wish to make.

We will repeat this decision process 20 times. At the end of the experiment, we will return to this task and *randomly* choose one of the 20 trials and pay you according to the outcome of that trial. Note that the outcome may be positive, zero or negative. We will exchange this point value into your earnings at $0.10 for each point. For example, if you earn 20 points on the randomly chosen trial, your earnings will increase by $2.00. For another example, if you lose 20 points on the randomly chosen trial, then your earnings will decrease by $2.00.

We will also provide you with an extra 100 points for this task regardless of how much you bid and earn for each trial. Thus, note that since you have this extra 100 points, you cannot end up with less than 0 points no matter what you bid and earn on each trial, though of course the more points you earn the more you will get paid.

There are two things which we would like to stress before you begin the experiment. First, the values of the companies on each trial are randomly determined by the draws of chips from the jar, and are thus statistically independent. This means that knowing the value of the company or companies in any previous trial or trials gives you no information about what the value will be in the next trial. This means, for example, that if you observe a high value one trial you should neither believe that there is a trend for companies to have high values nor that the law of averages will cause the value in the next trial to be low.

Second, note that acquiring a company is a neutral event - your performance (and earnings) will be judged only on the value of your points earned or lost for the randomly chosen trial.

Last, note there are no right or wrong bids. If you have any questions, please let an experimenter help you at this point. Otherwise, let us know when you are ready to begin. We will do one trial at a time.

TABLE 1

Value to You (Your Value) for each value under current management (Target Value)

Target Value	Your Value	Target Value	Your Value	Target Value	Your Value	Target Value	Your Value
0	0.0	26	39.0	52	78.0	78	117.0
1	1.5	27	40.5	53	79.5	79	118.5
2	3.0	28	42.0	54	81.0	80	120.0
3	4.5	29	43.5	55	82.5	81	121.5
4	6.0	30	45.0	56	84.0	82	123.0
5	7.5	31	46.5	57	85.5	83	124.5
6	9.0	32	48.0	58	87.0	84	126.0
7	10.5	33	49.5	59	88.5	85	27.5
8	12.0	34	51.0	60	90.0	86	129.0
9	13.5	35	52.5	61	91.5	87	130.5
10	15.0	36	54.0	62	93.0	88	132.0
11	16.5	37	55.5	63	94.5	89	133.5
12	18.0	38	57.0	64	96.0	90	135.0
13	19.5	39	58.5	65	97.5	91	136.5
14	21.0	40	60.0	66	99.0	92	138.0
15	22.5	41	61.5	67	100.5	93	139.5
16	24.0	42	63.0	68	102.0	94	141.0
17	25.5	43	64.5	69	103.5	95	142.5
18	27.0	44	66.0	70	105.0	96	144.0
19	28.5	45	67.5	71	106.5	97	145.5
20	30.0	46	69.0	72	108.0	98	147.0
21	31.5	47	70.5	73	109.5	99	148.5
22	33.0	48	72.0	74	111.0	100	150.0
23	34.5	49	73.5	75	112.5		
24	36.0	50	75.0	76	114.0		
25	37.5	51	76.5	77	115.5		

Record Sheet

Trial	Your Bid	Chip Draw	Value to you (= 1.5 * Draw)	Profit/Loss (for Trial)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Task 3

1) Overview

In this task, we are going to pay you for the accuracy of your response for each question. For each question, please provide a numerical answer. Each question refers to the task you completed about taking over a firm, and you may refer to the instructions as you answer these questions.

2) Getting paid

For each question you answer correctly, we will add $0.25 to your earnings for your participation.

3) Procedures

Please take as much or as little time as you like to answer each question. Note also that unlike the previous two tasks, there is one correct answer for each question.

If you have any questions, please let us know, otherwise please let us know when you are ready, and we will pass out your set of questions.

ID __________

Question 1: If you bid 17 and the firm value is 21, will you takeover the firm? Yes No

Question 2: If you bid 68 and the firm value is 3, will you takeover the firm? Yes No

Question 3: If you had **bid 50** and we **drew the number 80**, then your payoff for the task would be?

Question 4: If you had **bid 40** and we **drew the number 10**, then your payoff for the task would be?

Question 5: If you had **bid 80** and we **drew the number 60**, then your payoff for the task would be?

Question 6: If you had **bid 60**, then how many different numbers could we have drawn so that you would **NOT** have acquired the target firm?

Question 7: If you had **bid 60**, then how many different numbers could we have drawn so that you would have acquired the target firm and made **a positive profit**?

Question 8: If you had **bid 60**, then how many different numbers could we have drawn so that you would have acquired the target firm but **suffered a loss**?

Question 9: If you had **bid 0**, then how many different numbers could we have drawn so that you would **NOT** have acquired the target firm?

Question 10: If you had **bid 0**, then how many different numbers could we have drawn so that you would have acquired the target firm and made **a positive profit**?

Question 11: If you had **bid 0**, then how many different numbers could we have drawn so that you would have acquired the target firm but **suffered a loss**?

Question 12: If you had **bid 12**, then how many different numbers could we have drawn so that you would **NOT** have acquired the target firm?

Question 13: If you had **bid 12**, then how many different numbers could we have drawn so that you would have acquired the target firm and made **a positive profit**?

Question 14: If you had **bid 12**, then how many different numbers could we have drawn so that you would have acquired the target firm but **suffered a loss**?

When you completed these questions, please let us know.