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THE ROLE OF ANTICIPATED WEALTH IN RISK PREFERENCES

The Role of Anticipated Wealth
in Risk Preferences

Thesis submitted in partial fulfillment of the requirements
for the Honors Program

By

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Introduction

Studies done on risk preferences identify that there are three categories of risk behavior. People are either risk-seeking (willing to give up financial return for the thrill of taking on more risk), risk-averse (willing to give up return to reduce risk), or risk-neutral (risk plays no role in decisions; only returns are important).

Studies in economics have determined that the wealth of an individual will affect his/her risk preferences. In general, as an individual's wealth increases, the value of $1 declines. Consequently, people with more wealth appear to be less risk-averse than those with less wealth. Some experimentalists in economics question the ruling definition of the wealth effect, which states that only a person's current wealth has an effect on that individual's risk preference. They argue that it is not past or current wealth that affects a person's risk preference, but that it is his/her anticipated wealth that is more of a driver.

It is this idea that anticipated wealth may play a significant role in a person's risk preferences that I plan to study. I intend to find out whether or not anticipated wealth significantly affects an individual's risk preferences and what the magnitude of that affect on risk preferences is.

Literature Review

The wealth effect has been traditionally described as being the dollar amount that a person would spend out of certain amount of increase in wealth. Wealth, as described in this viewpoint, is the amount of tangible and financial assets one has (Anania 1). Mehra applied cointegration and error correction methodology to estimate aggregate consumption equations which were to relate consumer spending to labor income and household wealth. In that application, the results showed unmistakably that wealth has a significant effect on consumer spending (Mehra 45).

Mehra was able to come to the conclusion that wealth has a significant effect on consumer spending after doing empirical tests for the presence of a long-run equilibrium relationship between the levels of aggregate consumer spending and their economic determinants, such as labor income and wealth (Mehra 46). The main goal of his study was to investigate whether wealth had any predictive content for future consumption. If it were shown to have this content, then changes in wealth might possibly lead to changes in consumer spending (Mehra 47). The results of Mehra's experiment indicated that "while wealth has a significant effect on consumer spending, the long-term marginal propensity to consume out of wealth is small" (Mehra 50).

Even though the marginal propensity to consume out of gains in household wealth is much lower than out of income, wealth can, nevertheless, lead to very measurable effects on consumer spending when large and sustained changes in wealth occur. Between the years 1995 and 1999, the run-up in stock market wealth is estimated to have added 1 to 2 percentage points to the inflation-adjusted consumption growth in the United States (Anania 1). These estimates are in keeping with Alan Greenspan's testimony before the U.S. House of Representatives on February 17, 2000, and before the Committee on Banking, Housing, and Urban Affairs of the U.S. Senate on July 20, 2000 (Mehra 51).

Another result from Mehra's research showed that the short-term consumption equations that were estimated indeed indicated that consumption does respond to the current-period changes in wealth and income. However, the consumption was also correlated with lagged values of income and wealth variables, implying that short-term swings in household wealth generated by the changing equity values could very well lead to short-term swings in consumer spending (Mehra 54).

In light of this, it is generally agreed that the wealth effect typically tends to work with a time lag between a change in wealth and a change in consumer spending. By some estimates, it may take up to two years for a change in wealth to fully carry through to consumer spending (Anania 2).

Another study on the wealth effect was done by two staffers of the Federal Reserve Bank of New York. Economist Sydney Ludvigson and Senior Vice-President Charles Steindel wrote in their study that there is no reliable correlation between stock market gains and future consumer spending (Coy 24). In short, the two say that the "wealth effect" on consumers, be it up or down, is widely overstated (Kruger 56) and the temporary fluctuations in stock values have "virtually no impact on consumption" ("The Wealth Effect Myth" 1). They concluded, however, that on average a lasting $1 increase in stock wealth leads to a 3 cent to 4 cent increase in annual consumption. They say that this average is "a very shaky reed to lean on" because at various times the wealth effect has fluctuated from 2 cents to almost 11 cents (Coy 24).

Economists Martin Lettau and Sydney Ludvigson say that consumers make a distinction between their "permanent wealth" and "transitory wealth." Permanent wealth is a consumer's assets, like bank savings, that are unlikely to lose value with fluctuations in the market. A consumer's transitory wealth is defined as assets such as stocks and bonds that could erode due to market fluctuations (Kruger 56).

When comparing consumption data to labor income and investment assets all the way back to 1950, Lettau and Ludvigson concluded that permanent wealth is the prime mover of consumer spending. They argue that many changes in asset wealth are transitory (take, for example, the market crash of 1987) and, consequently, have no impact on consumer buying habits. They said that "households appear to pay little attention to the transitory swings in their net worth," even though at some point consumers do consider parts of their portfolio as permanent wealth. This only happens, though, when the consumers view those parts as "sustainable" (Kruger 56).

Another factor to consider is what can be called the "confidence factor." Christopher D. Carroll, an economist at Johns Hopkins University, says that, in recent years, consumer spending seems to be depending more and more on how confident about the future that consumers feel. A decline in sentiment, along with a sustained plunge in stock wealth, could eventually provoke what Carroll calls a "fairly vicious decline in consumption" (Pennar 32).

How quickly does the wealth effect begin to take hold? The answer to that question appears to be, "It depends." As was stated earlier, one estimate puts the amount of time for the wealth effect to take hold as being two years. Another paper by Samuel Bulmash finds that investors/consumers do not respond immediately to a rise or fall in the stock market. Rather, they wait at first and, thereafter, gradually increase their spending only after they are convinced that the gain is going to be permanent (Bulmash 75).

Ludvigson and Steindel say that it is impossible to predict how quickly the wealth effect, however big it is, will kick in. They say that it can take years for consumer spending to reach a permanently higher level. They conclude that "forecasts of future consumption growth are not typically improved by taking changes in existing wealth into account" (Coy 24). With these three differing views of the timing of the wealth effect, the best way to answer the question of when the wealth effect will take place is, "It depends."

The research and studies on the wealth effect as presented in this review thus far focus only on current wealth and involve mainly macroeconomic variables and data dealing with the economy in general. It has been suggested by Davis and Holt that anticipated wealth may be significant, if not as important as, already experienced changes in wealth in the contexts of experimental research (Davis 85). The experiments necessary to test this suggestion require that the experiments be with people, where all other factors are controlled and monitored. In this context, the expectation is that anticipated wealth may have an impact on participants in experiments, although most scientists disagree with this notion. They hold that only current wealth has a significant impact on trading behavior in experiments.

The conflict over the relevance of anticipated wealth in addition to current wealth on trading behavior in experiments presented an intriguing question. That question is the focus of this thesis.

Hypothesis

I intend to test the hypothesis that anticipated wealth plays a significant role in the choices of individuals, in this case the bid price. The hypothesis can be described by the following:

> H_0 : Anticipated wealth significantly affects the bids when current wealth is controlled
>
> H_a : Anticipated wealth does not significantly affect the bids when current wealth is controlled

While current wealth is easily understood and measured, anticipated wealth is not. Hence, definitions in the context of the conducted experiment must be created.

The experiment basically consisted of 36 periods in which groups of 8 subjects bid against one another to buy gambles. Those who bid successfully earned or lost money on the outcomes of the gambles. Those subjects who did not bid successfully did not change their wealth. See more details of the experiment in the Methodology section.

Current wealth in the experiment is the money the subject had before making a bid on the gamble. Subjects were given \$10 or \$15 to begin the experiment. They could increase or decrease that amount based on whether they made successful bids and the outcomes of the gambles that were purchased.

Anticipated wealth is likely determined based on a subject's past success/failure in building his current wealth. Four different definitions will be used to represent anticipated wealth.

Definition 1

AW = anticipated wealth
CW = current wealth
OW = original wealth
n = upcoming turn #
y = # turns remaining

$$AW_1 = CW_{n-1} + \left(\frac{(CW_{n-1} - OW)}{n - 1} * y \right)$$

This definition attempts to describe the effect that anticipated wealth has on the bid price when the individual is considering the average earnings from previous periods and projecting those earnings to the very end of the experiment. This definition looks long-term into the past to the very beginning of the experiment, and long-term into the future to the very end of the experiment.

Definition 2

$$AW_2 = CW_{n-1} + \left(\frac{(CW_{n-1} - OW) + (CW_{n-2} - OW) + (CW_{n-3} - OW)}{3} * y \right)$$

This definition attempts to describe the effect that anticipated wealth has on the bid price when an individual considers the increase in wealth over just the last three turns (or periods) in his projection of his anticipated wealth at the end of the experiment. This definition looks short-term into the past at just the last three turns, and long-term into the future to the end of the experiment.

Definition 3

$$AW_3 = CW_{n-1} + \left(\frac{(CW_{n-1} - OW) + (CW_{n-2} - OW) + (CW_{n-3} - OW)}{3} \right)$$

This definition attempts to capture the effect that anticipated wealth has on the bid price when an individual considers the increase in wealth over the last three turns in his projection of his anticipated wealth after the upcoming turn. This definition looks short-term into the past as just the last three turns, and short-term into the future to just the end of the upcoming turn.

Definition 4

$$AW_4 = CW_{n-1} + \left(\frac{CW_{n-1} - OW}{n - 1}\right)$$

This definition attempts to capture the effect that anticipated wealth has on the bid price when an individual is considering the average earnings from all previous periods to add to his wealth after the upcoming turn. This definition looks long-term into the past to the very beginning of the experiment, and short-term into the future to the end of the upcoming turn.

The hypothesis will be tested using each of the four definitions described above. Because the concept of anticipated wealth has never been formally defined, the definitions had to be created and should not be considered proven equations.

Methodology[1]

In the experiments, subjects priced gambles with identical expected values. The gambles were offered in groups of three, called trios. The gambles offered payoffs equal to the amount of $0, $1.50, and $3. The trios were designed to be a choice between a gamble G= (P_{Low}, P_{Medium}, and P_{High}) and a transformation of G with .20 of the probability of the middle payoff being shifted evenly to both the low and high payoffs. The repeated shifting of probability from the middle to the extreme payoffs results in trios of gambles with the same expected value. The gamble trios were offered in random order as were the low, medium, and high risk gambles within a trio.

Fifth-price sealed-bid auctions were employed for the market level experiments (see appendix for the complete set of instructions). At the beginning of the auctions, each subject was given an initial account balance of $10 or $15. Throughout the auctions, the subjects' gains or losses were posted to their account. For each auction, the subjects submitted bids to purchase all the gambles offered in a trio. After the bidding, the market price (the fifth-highest price) for the first gamble in a trio was announced. The buyers were those four subjects who had submitted bids greater than the market price.

The gamble was then resolved by randomly selecting a ticket out of a box of 100 tickets numbered from 1 to 100. These tickets represented probabilities. The procedure was repeated for the second and third gambles in the trio. Gains/losses from the transactions increased/decreased the subjects' account balances. New bids were then solicited from the entire group for the next trio of gambles. The six trios of gambles were offered twice. No gamble trio was repeated until all the trios had been presented once,

[1] The experiments were conducted by Dorla Evans & Sunny Duddilla in 1993. This section describes the methodology used to carry out the experiments and is taken from Evans (1997).

and the order of the gambles in the repetition of the market was changed. The subjects were paid their final balance at the end of the experiment.

Fifteen auctions were conducted with 109 total subjects participating. Nine of the experiments were comprised only of experienced subjects. The 109 subjects made a total of 3,924 bids in the auction. The experimental design allowed for the observation of a sample of subjects as they made trading decisions over time. In this way, a panel data set was created to analyze trader bidding and its various determinants.

The data gathered from the experiments were then used in a regression analysis for this paper. The regression analysis was applied to each of the four definitions previously stated; the results from the regression analysis were then used to reach a conclusion relating to the hypothesis.

The rest of the methodology concerns the independent variables in the experiment. These variables have been found to be relevant in previous work by Evans (1997). The first variable, t, is the time period in the experiment which ranges from 1 to 36. The second variable, mkmkt, is the number of times a subject set the market price, which is the fifth highest price.

In this experiment, subjects were required to set bids on the values of gambles when given full information about their probabilities and payoffs. Rational financial models require subjects to estimate the mean and the standard deviation of a gamble when judging its value. Thus, these characteristics are included in independent variables as EV1 and STD1, respectively.

Although the subjects have received full information about the gambles, they still differ in their ability to interpret or process the information into accurate expected values and standard deviations. Two variables have been included to capture the subjects' variation in these abilities: pricing errors (errs) and the location of gamble at the edge versus the hypotenuse in the unit triangle (edgehyp).

Tests of a variety of generalized utility theories (e.g., prospect theory and rank-dependent probability expected utility) support the notion that people weigh the probabilities of outcomes in a non-linear way, causing violations of stochastic dominance. The violations imply that gambles on the edge versus the hypotenuse sides of the unit triangle are perceived differently. Edgehyp is a time-varying dummy variable equal to 1 if the gamble lies on the edge of the triangle and equal to 0 if it lies along the hypotenuse.

Pricing errors (errs) represent the dollar differences in a subject's bid for a gamble the first and second time it was offered (in the initial and repeated conditions). The variable is relevant only for the second half of the experiment because computing the error requires both the initial and repeated bids. The pricing errors are set at zero for the initial condition.

Experienced subjects have had more practice in setting bids. Included is a variable for experience, exp, where experience is given a value of 1 and inexperience is given a value of 0.

As a final measure of success over time, the trader's current wealth (w) is incorporated, calculated as the initial $10 to $15 that the subjects received for participating plus or minus earnings *prior to the current valuation*. Wealth is calculated as a trio of gambles because the subjects submit to the trio of bids together. Hence, this variable is lagged three periods and is time-varying.

These control variables are supposed to control for the variation in the dependent variable, the bid price. It is hypothesized that, in addition to all of the described control variables, wealth and anticipated wealth are also important. Therefore, the primary focus of the results discussion is not the control variables but the variables of the hypothesis, namely wealth and anticipated wealth.

Discussion of Results

In this experiment, two of the anticipated wealth definitions forecast to the end of the experiment and the other two definitions forecast the end of the next period. The results of the study will be described by these two sets of definitions. The reason for the separate comparison is that the two sets of definitions had very different results.

Anticipated Wealth Definitions 1 & 2

The first definition of wealth attempts to describe the effect that anticipated wealth has on the bid price when an individual is considering the average returns from previous periods and projecting those earnings to the very end of the experiment. The first definition can be described by the following equation:

$$AW_1 = CW_{n-1} + \left(\frac{(CW_{n-1} - OW)}{n - 1} * y \right)$$

From Table 1, the Wald X^2 for the first definition is 6295.67, a Prob > X^2 of 0.0000, and an R^2 of 0.580. This means that the regression analysis is significant, and the independent variables explain 58% of the variation in the bids.

Table 1 shows that the coefficient for the current wealth variable (W) is 0.015 and significant with a P>|z| value of 0.000. The coefficient for the anticipated wealth (EW) variable is -0.004 and significant with a P>|z| value of 0.019. The coefficient for current wealth signifies that for every $1 increase in current wealth, the bid price for the individual will go up by approximately 1.5 cents. The coefficient for anticipated wealth indicates that for every $1 increase in anticipated wealth, the bid price will go down by approximately 0.4 cents.

Table 1: Summary of Results

	Definition 1	Definition 2	Definition 3	Definition 4
t	.483 (0.000)	.484 (0.000)	.486 (0.000)	(dropped)
mkmkt	-.024 (0.000)	-.024 (0.000)	-.025 (0.000)	-.042 (0.000)
EV1	.860 (0.000)	.859 (0.000)	.860 (0.000)	.885 (0.000)
STD1	-.076 (0.001)	-.094 (0.000)	-.090 (0.001)	-.006 (0.854)
edgehyp	-.005 (0.759)	-.017 (0.287)	-.016 (0.297)	-.018 (0.407)
errs	.072 (0.000)	.072 (0.000)	.071 (0.000)	.250 (0.000)
exp	-.058 (0.190)	-.060 (0.182)	-.038 (0.409)	-.039 (0.418)
w	.015 (0.000)	.013 (0.000)	-.042 (0.011)	-.093 (0.002)
EW	-.004 (0.019)	-.0003 (0.124)	.028 (0.001)	.050 (0.001)
constant	.048 (0.600)	.050 (0.596)	.291 (0.013)	1.043 (0.000)
Σ u	.216	.220	.219	.214
Σ e	.373	.375	.375	.391
rho	.251	.256	.254	.230
R^2	.580	.588	.599	.562
Wald X^2	6295.67	6164.94	6186.65	2692.68
Prob > X^2	(0.0000)	(0.0000)	(0.0000)	(0.0000)

The fact that the coefficients are significant supports the hypothesis of this study that anticipated wealth is significant in addition to the significance of current wealth.

The second definition for anticipated wealth attempts to describe the effect that anticipated wealth has on the bid price when an individual considers the increase in wealth over just the last three turns in his projection of his anticipated wealth at the end of the experiment. The second definition can be described by the following equation:

$$AW_2 = CW_{n-1} + \left(\frac{(CW_{n-1} - OW) + (CW_{n-2} - OW) + (CW_{n-3} - OW)}{3} * y \right)$$

From Table 1, the Wald X^2 for the second definition is 6164.94, a Prob > X^2 of 0.0000, and an R^2 of 0.588. This means that the regression analysis is significant, and that the regression explains 58.8% of the variation in the bids.

Table 1 shows that the coefficient for the current wealth variable (W) is 0.013 and is significant with a P>|z| value of 0.000. The coefficient for the anticipated wealth (EW) variable is -0.003 but is not significant with a P>|z| value of 0.124. The coefficient for current wealth signifies that for every $1 increase in current wealth, the bid price for the individual will go up by approximately 1.3 cents. The coefficient for anticipated wealth should not be interpreted because it is not significant. Therefore, this regression does not support the null hypothesis.

The fact that the first definition supported the hypothesis that anticipated wealth is important when subjects make bids for a gamble while the second definition did not support the hypothesis suggests that people focus on their longer memories when it comes to performing and projecting to the end of an experiment than they do their short-term memories. With the second definition, the equation is assuming that the individual is only looking over the last three periods' worth of history, instead of looking at all of the history as the first definition does. This signifies, apparently, that more history is relevant in creating one's anticipated earnings at the end of an experiment.

Anticipated Wealth Definitions 3 & 4

Definitions 3 and 4 have in common that they are focusing on only the outcome at the end of the upcoming turn. These definitions demonstrate a different mindset than the first two definitions, which were concerned with the anticipated earnings at the end of the experiment.

The third definition of wealth attempts to capture the effect that anticipated wealth has in the bid price when an individual considers the increase in wealth over the last three turns to project his anticipated wealth after the upcoming turn. The third definition can be described by the following equation:

$$AW_3 = CW_{n-1} + \left(\frac{(CW_{n-1} - OW) + (CW_{n-2} - OW) + (CW_{n-3} - OW)}{3}\right)$$

From Table 1, the Wald X^2 for the third definition is 6186.65, a Prob > X^2 of 0.0000, and an R^2 of 0.599. This means that the regression analysis is significant, and that the regression explains 59.9% of the variation in the bid.

Table 1 shows that the coefficient for the current wealth variable (W) turned out to be -0.042 and is significant with a P>|z| value of 0.011. The coefficient for the anticipated wealth (EW) variable is 0.028 and is significant with a P>|z| value of 0.001. The coefficient for current wealth signifies that for every $1 increase in current wealth, the bid price for the individual will go down by approximately 4.2 cents. The coefficient for anticipated wealth indicates that for every $1 increase in anticipated wealth, the bid price will go up by approximately 2.8 cents.

The fact that the coefficients are significant supports the null hypothesis of this study that anticipated wealth is significant in addition to the significance of current wealth when considering the outcome of the upcoming turn.

The fourth definition of wealth attempts to capture the effect that anticipated wealth has on the bid price when an individual is considering the average earnings from all previous periods to add to his/her wealth after the upcoming turn.

The fourth definition can be described by the following equation:

$$AW_4 = CW_{n-1} + \left(\frac{CW_{n-1} - OW}{n - 1}\right)$$

From Table 1, the Wald X^2 for the fourth definition is 2692.68, a Prob > X^2 of 0.0000, and an R^2 of 0.562. This means that the regression analysis is significant, and that the regression explains 56.2% of the variation in the bid.

Table 1 shows that the coefficient for the current wealth variable (W) turned out to be -0.093 and is significant with a $P>|z|$ value of 0.002. The coefficient for the anticipated wealth (EW) variable is 0.050 and is significant with a $P>|z|$ value of 0.001. The coefficient for current wealth signifies that for every $1 increase in current wealth, the bid price for the individual will go down by approximately 9.3 cents. The coefficient for anticipated wealth indicates that for every $1 increase in anticipated wealth, the bid price will go up by approximately 5 cents.

The fact that the coefficients are significant further supports the hypothesis of this study that anticipated wealth is important in addition to current wealth to a subject determining his bid.

The reason that time (t) is not a factor in the regression analysis results is due to the fact that time was perfectly correlated with the fourth definition, having a correlation coefficient of 1.0. When two right-hand side variables are linearly dependent in this way, the regression analysis for the variable fails. When the software encounters this, it drops the offending variable and then proceeds accordingly.

What turned out to be very interesting in these last two definitions, Definitions 3 and 4, was that the signs of the coefficients for current and anticipated wealth changed from the first two definitions. Apparently, when an individual is anticipating wealth only one period ahead, the individual evaluates things very differently. Current wealth in this situation lowers the bid, while the anticipated wealth for the next period increases the bid.

Because Definitions 3 and 4 were proven to be significant, it must be true that in this experimental case the decision processes of the individuals change when considering their anticipated wealth at the end of the game versus at the end of the upcoming turn. The change in signs of the coefficients between the two sets of definitions was contrary to the expectations of this research. At the present time I do not have a plausible explanation for what occurred, but this event may be benefited by additional research in the future.

The change in the signs of the coefficients in Definitions 3 and 4 do not dramatically affect the outcome of the study. The original purpose of this research was to determine whether or not anticipated wealth was significant in the pricing of bids when looking ahead to the very end of the experiment, not the end of the upcoming turn. Definitions 3 and 4 were added to the research project out of curiosity as to how an individual would respond to changing the focus from the end of the experiment to only the end of the upcoming turn. The results of this curiosity may now require more research in the future.

Conclusion

The purpose of this research was to test whether anticipated wealth, in addition to current wealth, was a significant explanatory variable in bidding experiments. The results allow the conclusion that anticipated wealth is, in fact, a significant explanatory variable in bidding experiments.

Anticipated wealth was proven to be significant whether the individual was looking ahead to the very end of the experiment or only one period ahead. The signs of the coefficients for current and anticipated wealth were found to be different when looking ahead to the end of the experiment versus only looking ahead to the end of the upcoming turn. Even so, anticipated wealth was found to be significant in both of those scenarios. This now gives some empirical support to the idea that anticipated wealth plays a significant role in a person's risk preferences.

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APPENDIX A

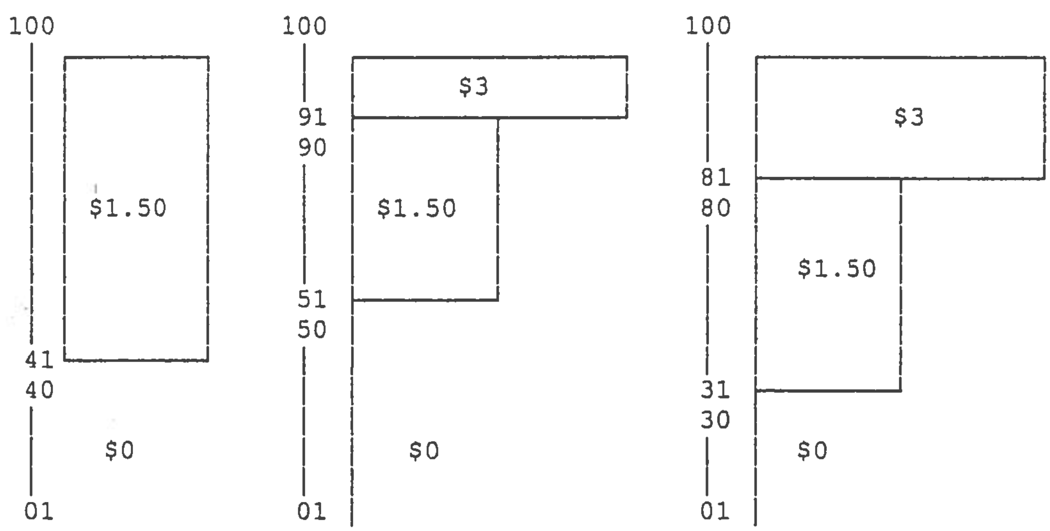
Instructions for Fifth Price Sealed-Bid Buying Auction

We will read the instructions together. If you do not understand the instructions, please ask for assistance. The monitors are here to help you.

This is an experiment in the economics of market decision making. The National Science Foundation and The University of Alabama in Huntsville have provided funds for the conduct of this research. If you follow the instructions closely and make appropriate decisions, you may make an appreciable amount of money. These earnings will be paid to you, in cash, at the conclusion of the experiment.

Introduction to Lotteries

You will be making pricing decisions on trios of lotteries. A lottery describes the outcomes of a decision and gives the probability of each outcome. See the lotteries below:



Lottery A　　Lottery B　　Lottery C

The outcomes of the lotteries above are determined by a random number between 01 and 100. Each of the numbers is equally likely to occur. Look at Lottery A. If a number between 01 and 40 were drawn, you would be paid $0; if any number between 41 and 100 were drawn, you would be paid $1.50.
The height of Lottery A's drawing illustrates the relative likelihood of each payoff. The distance between 01 and 40 is 40% of the total height of the line; the distance between 41 and 100 is 60% of the height of the line.

In Lottery B, if the random number were between 01 and 50, you would be paid $0; if the number were between 51 and 90, you would be paid $1.50; and if the number were between 91 and 100, you would be paid $3. Again, the heights of the lines indicate how likely each payoff is. The distance between 01 and 50 is 50% of the height; between 51 and 90 is 40%; and between 91 and 100 is 10%. Lottery C is interpreted in the same fashion as Lotteries A and B.

The widths of the rectangles indicate the size of the payoffs. For a payoff of $0 there is no rectangle, only a line. The $1.50 payoff rectangle is half the width of the $3 payoff rectangle.

General Instructions

In this experiment you will participate in a series of auctions in which you will be given the opportunity to purchase lotteries, which will be played for cash at the end of each auction.

You will be given a starting balance of $10 at the beginning of the experiment. The auction will be repeated fourteen times: two practice auctions (during which no payments will be made), followed by twelve purchase auctions (during which you will earn monetary payments). If you purchase no lotteries during the experiment, you will keep the $10 when you leave. If you purchase lotteries, your earnings will be:

STARTING BALANCE
- PAYMENTS FOR LOTTERIES
+ LOTTERY PAYOFFS

Your earnings will be tallied at the end of each auction. Instructions on how to tally your earnings on the attached **EARNINGS WORKSHEET** will be given shortly. Please note that persons who go bankrupt during any auction will not be allowed to participate in the remaining auctions.

Specific Instructions on the Auctions

You, along with several other individuals participating in the experiment, will take part in several auctions for lotteries. Four lotteries will be sold to four different participants in each auction. In each auction you will be asked to submit bids indicating how much you are willing to pay for each lottery in a trio. To see how the auction works, consider the following example.

Suppose there are eight participants submitting bids for a lottery: Bidder 1, Bidder 2, and so on through Bidder 8. The monitor will sell four of each lottery in a trio during each auction. The first step for each participant is to submit a bid for each lottery. Write your bids on one of the provided bid forms and give the form to the monitor. There will be four buyers for each lottery in each auction, one for each of the four lotteries sold. The buyers will be the four participants who submit the four highest bids. However, the price each buyer actually pays (the market price) will be the **fifth** highest submitted bid.

To illustrate the auction process, consider that the eight participants in a hypothetical auction submit the following bids:

Bidder 1	$300
Bidder 2	$450
Bidder 3	$295
Bidder 4	$330
Bidder 5	$280
Bidder 6	$455
Bidder 7	$250
Bidder 8	$320

We would then order all the bids from highest to lowest as follows:

1st highest bid - $455 by Bidder 6
2nd highest bid - $450 by Bidder 2
3rd highest bid - $330 by Bidder 4
4th highest bid - $320 by Bidder 8
5th highest bid - $300 by Bidder 1
6th highest bid - $295 by Bidder 3
7th highest bid - $280 by Bidder 5
8th highest bid - $250 by Bidder 7

Because the monitor is selling only four of each lottery during each auction, Bidders 6, 2, 4, and 8 are buyers in this auction because they submitted the four highest bids. Bidders 1, 3, 5, and 7 are not buyers as their bids were lower. However, the buyers (Bidders 6, 2, 4, and 8) do not have to pay the bid prices they submitted for the lottery. Instead each pays the "market price" which is determined by the fifth highest submitted bid. This market price is the value of the first bid below the lowest bid submitted by a buyer. In this example, the market price is $300, submitted by Bidder 1, who is not a buyer in this auction.

During the experiment we will report only the market price and not identify buyers by number. You will know you are a buyer if your bid is higher than the market price. At the end of the experiment you will have the opportunity to reconcile your records with ours.

You should note that no buyer has to pay the bid price he or she submitted unless the lowest buyer's bid and the market price are the same (tied). In the event of a tie at the market price, the buyer (or buyers) will be chosen by having each roll a die. The bidder (or bidders) who rolls the highest number (or numbers) will be declared a buyer (or buyers) and the market price will be the bid submitted by the tied participants. In all cases in which there is not a tie at the market price, buyers will not have to pay their submitted bids.

Some people argue that since you generally do not have to pay the bid price that you submit, it is in your best interest to write down a bid price exactly equal to the maximum amount you are willing to pay for a lottery. According to them, you do not want to submit a bid higher than the maximum amount you are willing to pay because the market price might turn out to be more than you are willing to pay. Also, they make the point that you do not gain by submitting a bid lower than the maximum amount you are willing to pay. To support their view, they provide the following example:

Suppose you are willing to pay as much as $400 for a lottery. If the market price turns out to be $300, you can buy a ticket for $300 when you would have been willing to pay as much as $400 ($100 more than the market price). Now, suppose that you thought the market price was going to be $250 and you submitted a bid of $275, even though you would have been willing to pay as much as $400. As a result of not correctly anticipating the market price, you would have lost the opportunity to purchase the lottery for $300 and the opportunity to realize a gain of $100 over the market price. Of course, if you truly would be willing to pay no more than $250, then that is the bid you should submit even if it means that you purchase no lotteries.

You are, of course, free to submit your bids using whatever approach you may wish to use. Keep track of your submitted bids and purchases on your Earnings Worksheet. In each auction period, record your submitted bid in column 3. As soon as the market price is determined, record the market price in column 4 and in column 5 indicate with a Y or N if you are or are not a buyer in the market. In column 6 record the amount spent in that auction: the market price if you purchased a lottery, or $0 if you did not. When the lottery has been resolved (described later), place the lottery payoff in column 2. In column 7 record your net profit (or loss) for that auction period: the lottery payoff (column 2) minus the amount spent (column 6) if you bought a lottery; or $0 if you did not. In column 8 compute your new balance: previous balance plus profits or minus losses. At the end of the experiment, your final balance will be paid to you.

If you are one of the buyers of a lottery, you will get to play the lottery for cash. The monitor will select a ticket from a container to determine your payoff. This container has 100 tickets numbered 01 through 100. The ticket will determine the outcome of the lotteries you buy. To see how you will be paid based on the ticket number, refer back to Lotteries A, B, and C on the first page. If the ticket number were 37 you would win $0 on either Lottery A or Lottery B but $1.50 on Lottery C. If the ticket number were 93, you would be paid $1.50 for Lottery A, but $3 for Lottery B or C.

At the end of the experiment, bring your Earnings Worksheet to the monitor for confirmation then for a cash payment. You will sign a receipt. Only one subject should go to the monitor at a time. Please do not talk to other subjects while waiting to be paid.

You will participate in two practice lottery sessions before we begin so that you can test your understanding of the instructions. No money can be earned or lost in the practice period.

At the end of the experiment, bring your worksheet to the monitor for a cash payment. He/she will pay you your earnings and you will sign a receipt. Only one subject should go to the monitor at a time. Please do not talk to other subjects while waiting to be paid

You may refer to the instructions at any time.