Individual Choice Behavior
The Endowment Effect

For next class: Read

- Think about possible explanations for the endowment effect

Read:

- Charles Plott and Kathryn Zeiler “Asymmetries in Exchange Behavior Incorrectly Interpreted as Evidence of Prospect Theory” AER, 2004.
- List, J.A. “Does Market Experience Eliminate Market Anomalies?,” *Quarterly Journal of Economics* (2003), 118(1), pp. 41-71.

Explanations for the Endowment Effect

Income effect: Those of you who received a pen are richer, and hence can value the pen more than the poorer ones among you who got no pen.

Design solution?

Trading Patterns (e.g., Knetsch, 1989, *AER*): Give half the people mugs, half chocolate, and see if trade occurs:

- 89% of those originally endowed with a mug chose to keep the mug
- 90% of those endowed with a chocolate bar decided to keep the chocolate bar

Explanations for the Endowment Effect 2

Loss Aversion:

Losses loom larger than gains.

Change in preferences: Instead of having loss aversion, Dan Gilbert suggests that participants start valuing the kind of good they have more. So, as if you suddenly all liked stylish Stanford pens more, not just the one in hand. This means it affects also how much you value a second Stanford pen.

Experiment: Have owners, and non-owners say how much they are willing to pay for a second item. The good in the experiment: mugs.

Is the endowment effect robust?

Field Experiments

For a long time, when economists spoke of "field experiments" they meant "social experiments" that were organized like clinical trials, ideally with randomized assignment of subjects into some social program intended e.g. to help unemployed workers find new employment.

Is the effect evident in market settings, or does market experience eliminate the endowment effect?

Several have attempted to examine this conjecture in n-shot lab studies (e.g., Knez et al., 1985, *AER*; Coursey et al., 1987, *QJE*; Shogren et al., 1994 *AER*)

Results are generally mixed

List, J.A. "Does Market Experience Eliminate Market Anomalies?," *QJE* (2003)

Markets used:

- Sports memorabilia at a sportscard show in Orlando, FL,
- collector pins in a market constructed by Walt Disney World at the Epcot Center in Orlando, FL.

"…these markets are natural settings for an experiment on the relationship between market experience and the endowment effect, as they provide natural variation across individual levels of expertise. In the sportscard show field experiments, I conduct some of the treatments with professional dealers and others with ordinary consumers. The design was used to capture the distinction between consumers who have intense trading experience (dealers) and those who have less trading experience (nondealers)."

"A major advantage of this particular field experimental design is that my laboratory is the marketplace: subjects would be engaging in similar activities whether I attended the event or went to the opera. In this sense, I am gathering data in the least obtrusive way possible while still maintaining the necessary control to execute a clean comparison between treatments. This highlights the naturalness of this particular setting, and the added realism associated with my field experiments."

Design I—Orlando Sportscard Show (Dec. 1999)

- Subjects are randomly endowed with one good
- Fewer than 50% of the subjects should trade their good if an endowment effect exists
- Good A is a Kansas City Royals game ticket stub dated June 14, 1996, was issued for admission to the baseball game in which Cal Ripken Jr. broke the world record for consecutive games played.
- Good B is a dated certificate commemorating the game that Nolan Ryan achieved what only 20 previous baseball players had done, winning 300 games (dated July 31, 1990), was distributed by the Milwaukee Brewers to fans in attendance of the ballgame.
- Each participant's experience typically followed three steps:
  - completing a survey
  - considering the potential trade
  - exit interview

An Endowment Effect is Evident

Variable	% Traded
Good A for Good B	32.8
Good B for Good A	34.6

Pooled sample (n = 148) Fisher exact test: $p < 0.001$

Subjects are nearly two times more likely to keep the endowed good

A Link Appears to Exist Between the Endowment Effect and Trading Experience

- Dealers (n = 74)
  - Good A for Good B 45.7 p = 0.194
  - Good B for Good A 43.6
- Nondealers (n = 74)
  - Good A for Good B 20.0 p < 0.001
  - Good B for Good A 25.6

- Nondealers are nearly 3.5 times more likely to select the good which they were endowed
- Dealers are 1.25 times more likely to choose their endowed good.

Variable	% Traded	p-value for Fisher's exact test
Experienced nondealers (n = 30) (6 or more trades per month)	46.7	0.32
Inexperienced nondealers (n = 44)	6.80	< 0.01

- Inexperienced consumers are 13 times more likely to keep their endowed good.

Experiment II—Pin Trading (May 2000)

Collector pin market in *Walt Disney World's Epcot Center* in Orlando, FL.:

Higher percentage of female traders

Quite popular

- Pins have changed hands since the first modern Olympic Games in Athens in 1896.
- In the Atlanta Olympic Games, more than 1.2 million people visited the two Olympic Pin Trading Centers, where an estimated 3 million pins changed hands during the Games
  - Good C is a cloisonné (enamel) pin of Mickey and Minnie Mouse which was issued on Valentines Day, 2000. The pin retailed for approximately $20 and sold-out within days of its issuance.
  - Good D is a cloisonné pin of Mickey Mouse which was issued on St Patrick's Day, 2000. Also retailed for approximately $20 and sold-out within days of its issuance.

An Endowment Effect is Evident

Variable	% Traded
Good C for Good D	25.0
Good D for Good C	32.5

p-value for Fisher's exact test: Pooled sample (n = 80), $p < 0.001$

- Subjects are nearly 2.5 times more likely to keep endowed good.

A Link Appears to Exist Between the Endowment Effect and Trading Experience

Variable	% Traded	p-value
Experienced nondealers (n = 20) (7 or more trades per month)	40.0	0.26
Inexperienced nondealers (n = 60)	25.0	< 0.001
Experienced nondealers (n = 30) (5 or more trades per month)	46.7	0.30
Inexperienced nondealers (n = 50)	18.0	<0.001

Preference reversals

- Lichtenstein, Sarah and Paul Slovic. “Reversals of Preference Between Bids and Choices in Gambling Situations,” *Journal of Experimental Psychology, 89, Jan. 1971, pp. 46-55.*

- Lichtenstein, Sarah and Paul Slovic. “Response-induced Reversals of Preference in Gambling: An Extended Replication in Las Vegas,” *Journal of Experimental Psychology, 101, Nov.* 1973 pp. 16-20.

- Grether, David M. and Charles R. Plott. "Economic Theory of Choice and the Preference Reversal Phenomenon," *American Economic Review, 69, Sept. 1979, pp. 623-38.*

Preference reversals

L1 = [.2 $100; .8 $0]; L2 = [.9 $22; .1 $0]

- Task 1: choose between L1 and L2

- Task 2: suppose you own Li, what price would you have to be paid to sell it…

Result: L1 is referred to as the $ bet, L2 the p bet…

Putting prices on (unfamiliar) things turns out to be a difficult task, and the results are sensitive to how you're asked.

"COHERENT ARBITRARINESS": STABLE DEMAND CURVES WITHOUT STABLE PREFERENCES

Ariely, Loewenstein and Prelec, QJE 2003

A nice demonstration that people may not have a clear idea how much they value – and how to price - unfamiliar things.

Experiment 1:

- 55 MBA students: see 6 products (without the market price: on average $70).
- First: Subjects were asked if they were willing to buy each product for a dollar figure = last 2 digits of their Social security number.
- Then: subjects stated their Willingness to pay.
- A random device was used to decide which answer is decisive and for the WTP a BDM procedure was used.

Table 1: Average stated willingness-to-pay sorted by quintile of the sample's Social Security number distribution. The last raw indicates the correlations between Social Security numbers and WTP (and their significance levels).

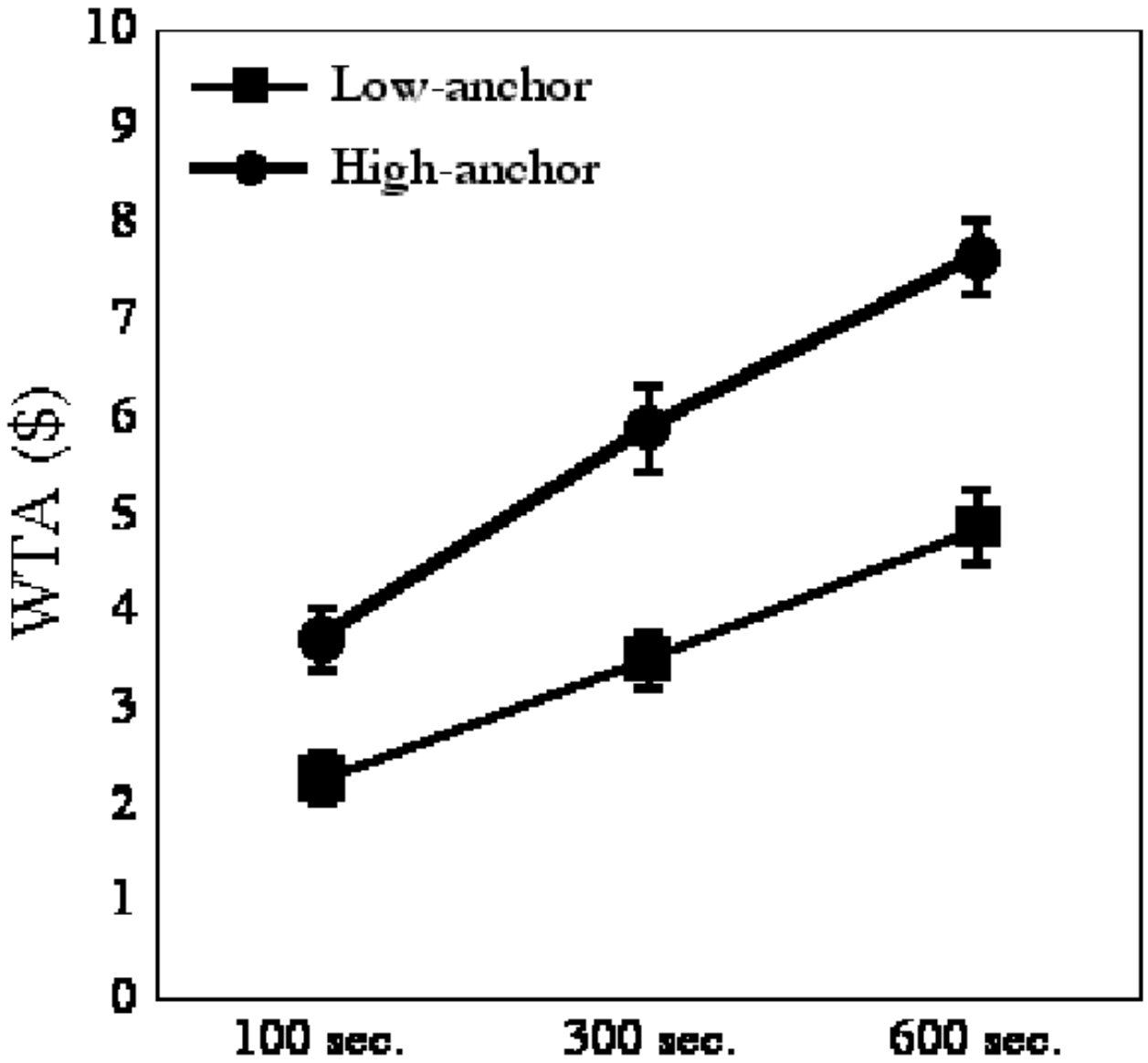
Quintile of SS# distribution	Cordless trackball	Cordless keyboard	Average wine	Rare wine	Design book	Belgian chocolates
1	$ 8.64	$ 16.09	$ 8.64	$ 11.73	$ 12.82	$ 9.55
2	$ 11.82	$ 26.82	$ 14.45	$ 22.45	$ 16.18	$ 10.64
3	$ 13.45	$ 29.27	$ 12.55	$ 18.09	$ 15.82	$ 12.45
4	$ 21.18	$ 34.55	$ 15.45	$ 24.55	$ 19.27	$ 13.27
5	$ 26.18	$ 55.64	$ 27.91	$ 37.55	$ 30.00	$ 20.64
Correlations	.415	.516	0.328	.328	0.319	.419
	p = .0015	p < .0001	p = .014	p = .0153	p =.0172	p =.0013

While it seems hard to price certain items, it seems that the relative ordering within the categories of wine and computer accessories are preserved.

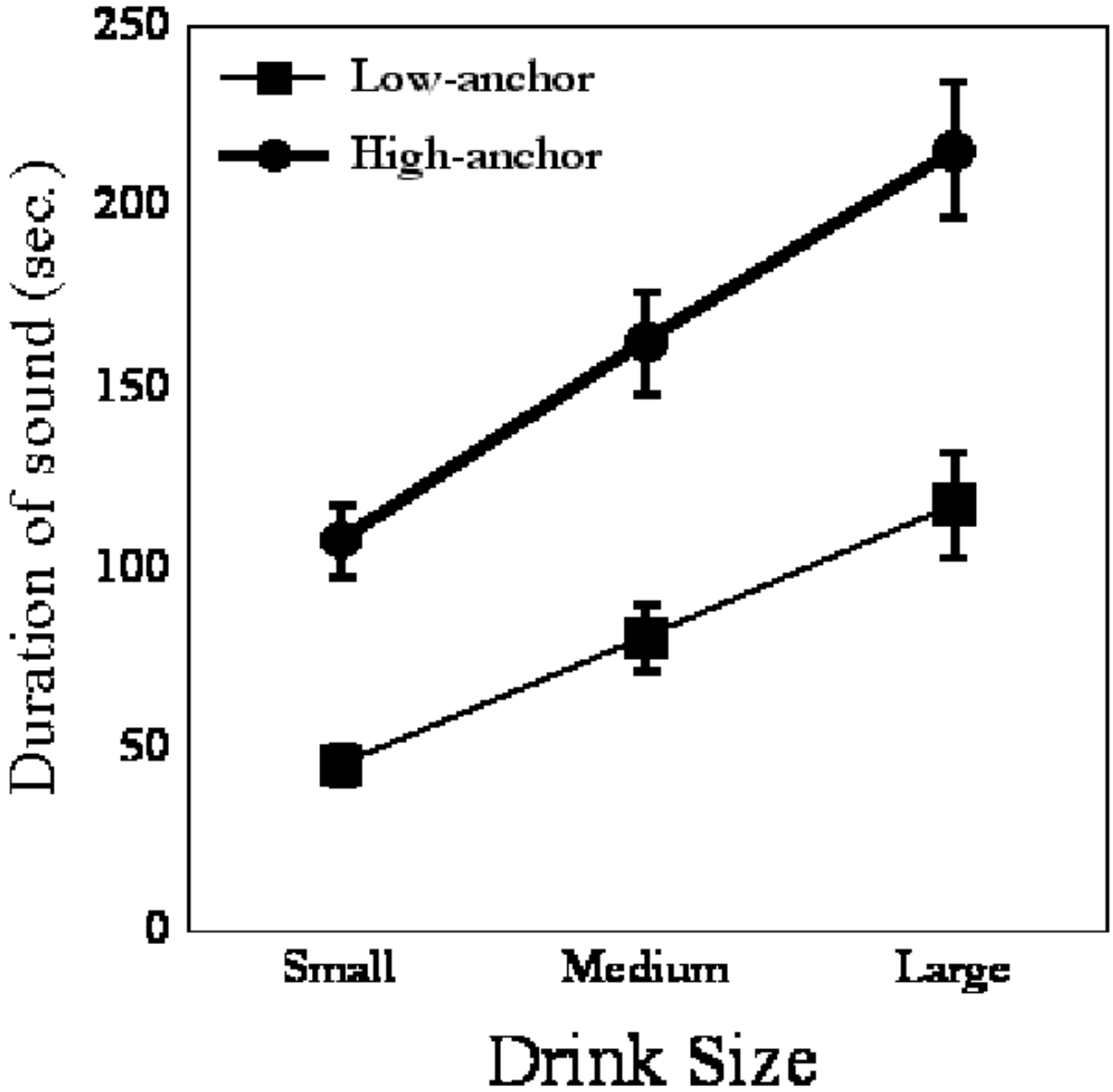
Test directly whether indeed pricing is coherent within a category.

Experiment 3:

- Annoying sounds of 100, 300 and 600 seconds.
- First, subjects are asked about the last 3 digit number of their social security number. Ask: do they hypothetically want listen again to the sound they just experienced (for 300 seconds) if they were paid the money amount they had generated from their social security number? (anchoring)
- Experiment: subjects listen to sounds in exchange for payment. The 3 different durations were ordered in either an increasing set (100 seconds, 300 s, 600 s) or a decreasing set (600 s, 300 s, 100 s).
- In each trial, after they indicated their WTA, subjects were shown both their own price and the random price drawn from the distribution.
  - If the price set by the subject was higher than the computer's price, subjects continued directly to the next trial.
  - If the price set by the subjects was lower than the computer's price, subjects received the sound and the money associated with it (the amount set by the randomly drawn number), and then continued to the next trial.
- This process repeated itself 3 times, once for each of the three durations.


10
9
8
7
6
5
4
3
2
1
0
WTA ($)
Low-anchor
High-anchor
100 sec.
300 sec.
600 sec.

- It seems hard to value good or experiences compared to money (or easy to manipulate).
- How about trading off various experiences?
- Compare ounces of unpleasant liquid (composed of equal parts of Gatorade and Vinegar) and have people choose between the liquid and the unpleasant sound.
- First hypothetical question: Do you want to drink this liquid compared to 1 or 3 minutes of unpleasant sound.
- Then ask: For each drink size (small medium or large) what is the highest number of seconds of unpleasant noise, s.t. you prefer the unpleasant noise…


250
200
150
100
50
0
Duration of sound (sec.)
Low-anchor
High-anchor
Small
Medium
Large
Drink Size

We will see: Not only is it difficult for people to know what preferences they have, their preferences may sometimes be unstable because we have troubles remembering, or correctly evaluating an experience.

Kahneman, Daniel, Peter Wakker and Rakesh Sarin, 1997, “Back to Bentham? Explorations of Experienced Utility”, Quarterly Journal of Economics.

Kahneman et al Psychological Science 1993.

When remembering an experience, some people argue that we follow a “peak-end” rule. That is, the peak and the final unpleasantness of an event, determine (largely) how we evaluate that event.

Experiment:

- In the Short trial the subject kept one hand in water at 14°C for 60 seconds, after which he was allowed to remove the hand from the water and to dry it with a warm towel.
- In the Long trial the immersion lasted a total of 90 seconds. Water temperature was kept at 14° for the first 60 seconds, at which point (unbeknownst to the subject) the experimenter caused the temperature of the water to rise gradually from 14° to 15° over the next 30 seconds.
- Different hands were used for the Short and for the Long trials. Half the subjects experienced the Short trial before the Long one; the sequence was reversed for the other subjects.
- The trials were separated by seven minutes during which the subject performed an unrelated task, which was resumed after the second trial.
- Seven minutes later, the subject was called in for a third trial, informed that one of the two previous procedures would be repeated exactly, given a choice of whether the first or the second trial should be repeated, and asked to answer several questions about the first two trials.

- On a “discomfort meter” from 0 (no pain at all) to 14 (intolerable pain) the 32 participants continuously indicate the pain they experience.
- 21 subjects record a decline in pain in the warmer water. The long trial had a lower average of peak and end pain than the short trial for those subjects. As expected, a large majority of them (17 of 21) preferred to repeat the Long trial.
- The other eleven subjects did not indicate a significant decrease of pain as the temperature of the water was raised. For these subjects the Peak-End average was very similar on the Short and on the Long trial. Only five of the eleven subjects preferred the Long trial.
- The difference between the preferences of the two groups was statistically significant, as was the overall preference for the Long trial (69 percent for the 32 subjects).

- Kahneman et al did a similar thing with colonoscopies, leaving the colonoscope in place for a minute (extending discomfort!) but without wiggling it around (hence slightly less painful) yielded a significant improvement in the global evaluations of the procedure…

- If people are so bad at knowing what they want, does this leave room for paternalism?
- This comes up especially when thinking about saving and health care choices;
  - Thaler, Richard and Cass Sunstein. "Libertarian Paternalism." *American Economic Review*, 2003, 93(2), pp. 175-17

Kahneman and Tversky developed a big class of demonstrations of a variety of systematic violations both of simple rationality and of expected utility theory. The examples below were collected in

- Thaler, Richard "The Psychology of Choice and the Assumptions of Economics," in A.E. Roth, editor, *Laboratory Experimentation in Economics: Six Points of View*," Cambridge University Press, 1987.

Mental accounting

Problem 9. Imagine that you are about to purchase a jacket for ($125) [$15] and a calculator for ($15) [$125]. The calculator salesman informs you that the calculator you wish to buy is on sale for ($10) [$120] at the other branch of the store, a 20-minute drive away. Would you make the trip to the other store?

- [*Source:* Tversky and Kahneman, 1981]

Problem 10. Imagine that you have decided to see a play, admission to which is $10 per ticket. As you enter the theater you discover that you have lost a $10 bill. Would you still pay $10 for the ticket to the play?

- Yes: 88%No: 12%

Problem 11. Imagine that you have decided to see a play and paid the admission price of $10 per ticket. As you enter the theater you discover that you have lost your ticket. The seat was not marked and the ticket cannot be recovered. Would you pay $10 for another ticket?

- Yes: 46%No: 54%

[Source: Tversky & Kahneman, 1981]

Sunk Costs

Problem 12. You have tickets to a basketball game in a city 60 miles from your home. On the day of the game there is a major snow storm, and the roads are very bad. Holding constant the value you place on going to the game, are you more likely to go to the game

- (1) if you paid $20 each for the tickets or
- (2) if you got the tickets for free?

- [*Source:*Thaler, 1980]

Field experiment

This has been replicated fairly cleanly in an experiment (Arkes and Blumer, ’85) in which season ticket holders to a campus theater group were randomly divided into two groups,

- Only one of which was given a refund on part of the price of the tickets.
- This group attended the first half of the season less regularly than the control group, which received no refund.

Time and Money

- Gourville and Soman (1998). "Payment Depreciation: The Behavioral Effects of Temporally Separating Payments from Consumption." Journal of Consumer Research, 25, 160-174.) look at participation rates of health club members as a function of when their twice-yearly dues come due. The fact that participation is highest in the month following billing supports the general contention that consumption of services is in part a function of when they were paid for.

(This is also a phenomenon first explored through hypothetical questions.)

- See also Della Vigna and Malmendier, “Paying Not to Go to the Gym,” *American Economic Review*, June 2006, vol. 96 (3), pp. 694-719, who find that many Boston gym goers repeatedly buy monthly contracts that they use sufficiently infrequently so that it would have been cheaper to buy day passes.

Intertemporal choice

Which would you prefer:

$10 today,	or	$15 in 2 weeks?
$10 in 50 weeks	or	$15 in 52 weeks?

Laibson and Rabin are two of the names associated with the burgeoning literature on modeling time preferences as hyperbolic rather than exponential, i.e. as

$$U = U_0 + \beta\Sigma\delta^t u_t$$

(summing over discounted future utilities at t = 1 to infinity)

instead of the more conventional (stationary over time) exponential formulation

$$U = U_0 + \Sigma\delta^t u_t$$

A good deal of thoughtful work has gone into drawing out the differences to be expected between rational and irrational hyperbolic discounters, a distinction based on whether they correctly anticipate their future preferences…

Preferences over other complex domains (not just gains and losses); e.g. preferences for fairness.

Problem 13. You are lying on the beach on a hot day. All you have to drink is ice water. For the past hour you have been thinking about how much you would enjoy a nice cold bottle of your favorite brand of beer.

A companion gets up to make a phone call and offers to bring back a beer from the only nearby place where beer is sold (a fancy resort hotel) [a small, rundown grocery store].

He says that the beer may be expensive and so asks how much you are willing to pay for it. He says that he will buy the beer if it costs as much as or less than the price you state, but if it costs more than the price you state he will not buy it. You trust your friend and there is no possibility of bargaining with (the bartender) [the store owner]. [Thaler, '85]

Gains and losses and sure things

Problem 7. Imagine that you face the following pair of concurrent decisions. First examine both decisions; then indicate the options you prefer:

- Decision (i). Choose between
  - A. A sure gain of $240 [84%]
  - B. 25% chance to gain $1,000 and 75% chance to lose nothing [16%]

- Decision (ii). Choose between
  - C. A sure loss of $750 [13%]
  - D. 75% chance to lose $1,000 and 25% chance to lose nothing [87%]

Problem 8. Choose between

E. 25% chance to win $240 and 75% chance to lose $760 [0%]
F. 25% chance to win $250 and 75%chance to lose $75 [100%]

[*Source:* Tversky and Kahneman, 1981]
But E = A&D and F = B&C

A different critique of utility theory

Econometrica, Vol. 68, No. 5 (September, 2000), 1281–1292

NOTES AND COMMENTS

RISK AVERSION AND EXPECTED-UTILITY THEORY: A CALIBRATION THEOREM

BY MATTHEW RABIN[1]

- Rabin considers utility functions defined on total wealth, u(w).

- That is, the set of alternatives A he considers is something like alternative values for the present value of your lifetime income.

- He notices that if u is concave, then if it has considerable curvature over all small intervals, concavity may imply that u is bounded.

- And even if u has considerable curvature for small intervals in some finite range [0,w], concavity (diminishing marginal returns) puts big limits on how fast u can grow.

Extreme risk aversion at all wealth levels implies

IF AVERSE TO 50-50 LOSE \$100 / GAIN g BETS FOR ALL WEALTH LEVELS, WILL TURN DOWN 50-50 LOSE L / GAIN G BETS; G'S ENTERED IN TABLE.

L	g = \$101	\$105	\$110	\$125
\$400	400	420	550	1,250
\$600	600	730	990	∞
\$800	800	1,050	2,090	∞
\$1,000	1,010	1,570	∞	∞
\$2,000	2,320	∞	∞	∞
\$4,000	5,750	∞	∞	∞
\$6,000	11,810	∞	∞	∞
\$8,000	34,940	∞	∞	∞
\$10,000	∞	∞	∞	∞
\$20,000	∞	∞	∞	∞

Even for finite wealth levels the results of assuming one utility function over all domains are extreme

TABLE II

TABLE I REPLICATED, FOR INITIAL WEALTH LEVEL $290,000, WHEN l/g BEHAVIOR IS ONLY KNOWN TO HOLD FOR $w \leq \$300{,}000$.

L	g \$101	\$105	\$110	\$125
\$400	400	420	550	1,250
\$600	600	730	990	36,000,000,000
\$800	800	1,050	2,090	90,000,000,000
\$1,000	1,010	1,570	718,190	160,000,000,000
\$2,000	2,320	69,930	12,210,880	850,000,000,000
\$4,000	5,750	635,670	60,528,930	9,400,000,000,000
\$6,000	11,510	1,557,360	180,000,000	89,000,000,000,000
\$8,000	19,290	3,058,540	510,000,000	830,000,000,000,000
\$10,000	27,780	5,503,790	1,300,000,000	7,700,000,000,000,000
\$20,000	85,750	71,799,110	160,000,000,000	540,000,000,000,000,000,000

How to interpret this?

Rabin and Thaler offer their view in a subsequent article:

Rabin and Thaler (2001), "Risk Aversion," Journal of Economic Perspectives

Expected Utility is an Ex-Hypothesis

While expected utility theory appeals to economists as a normative model of rational choice, almost from the beginning questions arose about the ability of the model to explain actual choices. For instance, Allais (1953) questioned whether people actually choose using linear probability weights, and Tversky and Kahneman (1981) showed that people's choices can vary depending on the wording (or "framing") of a problem, rather than its objective features. Because there have been repeated demonstrations of the shortcomings of the expected utility model, some readers may think that in pointing out further failures we are beating a dead horse.

There is much truth to this. Indeed, we aspire to have written one of the last articles debating the descriptive validity of the expected utility hypothesis. But we have also often been surprised by economists' reluctance to acknowledge the descriptive inadequacies of expected utility theory, and have found some of the explanations and justifications to keep expected utility alive to be remarkable.

Possible ("remarkable") reactions to Rabin: the usual suspects

- ***Markets may provide very different environments***
  - But some markets protect individuals more than others—e.g. securities markets versus housing markets or labor markets (which may discipline individual errors in some directions but not in others…)

- Results may be artifacts of presentation—some presentations may be more natural than others, and people may be more prone to various behaviors in some presentations than others
  - But marketers (e.g. of appliance insurance, etc.) will have an incentive to look for frames that encourage people to make bad decision

- Hypothetical vs real payoffs

- Learning versus inexperienced play

Palacios-Huerta and Serrano question the data in "Rejecting Small Gambles under Expected Utility," *Economics Letters* 91, (2006), 250-259.

http://www.econ.brown.edu/faculty/Serrano/pdfs/2006EL91.pdf

"We show that the flaw identified in this literature has little empirical support. In particular, we show that it is the assumption of rejecting small gambles over a large range of wealth levels, and not expected utility, that does not typically match real-world behavior.

In articulating our response, it is more useful not to argue whether expected utility is literally true (we know that it is not, since many violations of its underpinning axioms have been exhibited).

Rather, one should insist on the identification of a useful range of empirical applications where expected utility is a useful model to approximate, explain, and predict behavior.

Palacios-Huerta and Serrano point out that many estimates of risk aversion, even on small gambles, are much more moderate than those Rabin supposes.

And no experiment has been done to specifically look at whether big changes in wealth alter people's risk aversion for small gambles.

- It would be fun to be a subject in the increasing wealth condition of a within-subjects design, but it might be cheaper to do a between subjects design and ask people about their net worth, or future income expectations. But "narrow framing" might be a reason that Rabin's intuitions would be confirmed in the lab…

Basically, their argument is that, if you were approximately a utility maximizer over wealth, with some small systematic deviations, then if I try to estimate your risk aversion over ranges in which it should be zero, I'll get much less reliable estimates than if I estimate it over ranges in which it has a positive value (presuming that the systematic deviations don't get large over the same ranges as risk aversion gets large…)

- Another line of reaction to Rabin's paper has to do with the scope of the consistency requirements.

- Rabin looks at u(w) defined on all levels of wealth, and wants all decisions to be consistent with one another. Notice that, while this isn't an unreasonable thing to want, it is nowhere an assumption in the axiomatization of expected utility.

- His argument doesn't address the idea that utility theory might be a good approximation for "local use," i.e. for comparing lots of small decisions, or lots of big ones.

Implications for experimenters

Rabin and Thaler make an empirical prediction, about the literature of which their paper is a part.

- Looking at Allais, 1953, May, 1954, Ellsberg, 1961, Kahneman and Tversky, 1979, Rabin, 2000, Rabin and Thaler, 2001, They predict that the subsequence 1953, 1954, 1961, 1979, 2000, 2001 has converged.

If they are right, and they have indeed written the last paper on utility theory, which comes to be regarded as an "ex hypothesis," then of course experimenters will find themselves testing very different kinds of theories, and experiments will have to control for the hypotheses that become plausible to economists.

Even if their prediction about the general implications of Rabin's work is wrong, his observations may still have implications for experimenters.

One obvious, and perhaps uncontroversial implication, is that we need to be careful about what conclusions we draw from an experiment. We will need to be very careful if we're tempted to estimate individuals' risk aversion for large sums based on their choices for small sums. (We'll later talk about other domains on which the scale of payoffs raises questions about the possible generality or lack of it of experimental results: in this connection recall the debate about hypothetical versus real payoffs.)

Rabin, and Rabin and Thaler, also propose another implication of their work for experimenters: experimental designs should no longer use binary lottery games, or other tools to control for unobserved risk aversion.

My guess is that, as long as economists continue to use expected utility to formulate predictions, experiments that want to test those predictions that depend sensitively on agents' utility functions will either have to try to control them or measure them.

Alternatives to utility theory

It's hard to kill a theory simply by showing that it's false; it helps to propose alternatives.

Let's concentrate on one that has arisen from the psychology literature.

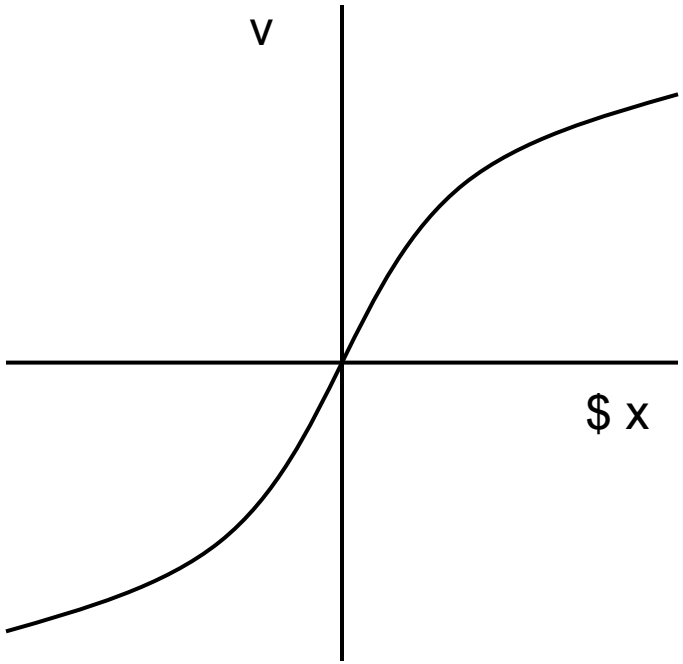
Prospect Theory

One attempt to summarize a number of observed or hypothesized regularities was Kahneman and Tversky'sProspect Theory (1979, Econometrica).

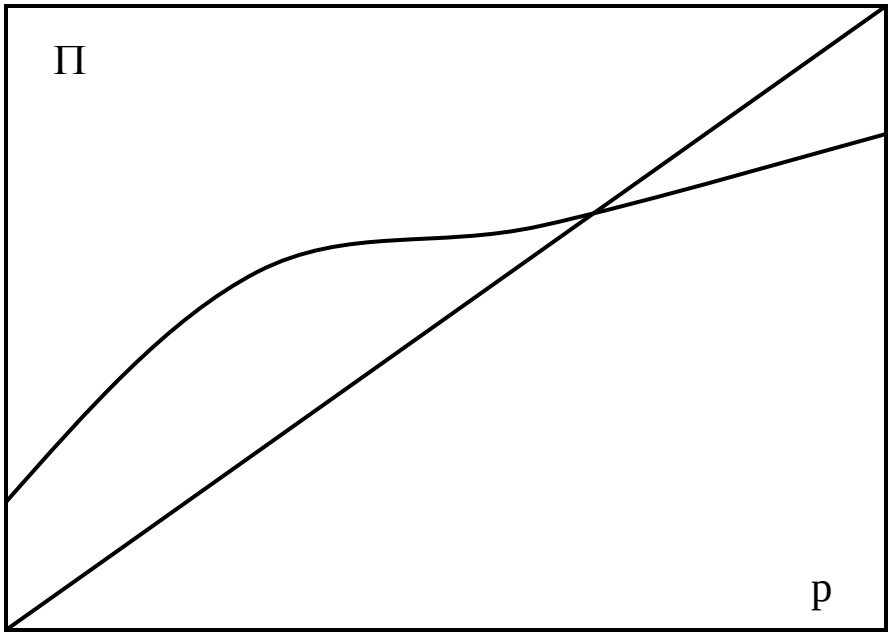
(See also the updated version, Tversky, Amos, and Daniel Kahneman. "Advances in Prospect Theory: Cumulative Representation of Uncertainty." *Journal of Risk and Uncertainty*5 (1992): 297-323)

Prospect Theory posits both a nonlinear "value function" that scales different monetary payoffs, and a nonlinear "weighting function" that scales different probabilities.

Evaluate Lotteries at (px) v (x) instead of pxu (x)



Losses loom larger than gains



Probability weighting function

Expected value, expected utility, prospect theory

Expected value: no personal parameters

Expected utility (e.g. convex utility functions for money, with a specific functional form, and a personal parameter of risk aversion)

Prospect theory: adds a reference point, a probability weighting function, and a value function that is convex in gains from the reference and concave in losses.

Prospect theory can fit a wider data set than theories with fewer parameters. How to evaluate this?

As prospect theory has become better known, it has also started to attract the kind of critical attention from experimenters that utility theory has attracted.

Harbaugh, Krause, and Vesterlund, ""The Fourfold Pattern of Risk Attitudes in Choice and Pricing Tasks," forthcoming, *Economic Journal*.

HK&V report that the predictions of cumulative prospect theory are sensitive to the way the questions are asked. (see Tversky, Amos, and Daniel Kahneman. "Advances in Prospect Theory: Cumulative Representation of Uncertainty." *Journal of Risk and Uncertainty*5 (1992): 297-323))

Distinctive Fourfold Pattern Summarized by CPT:

- risk-seeking over low-probability gains
- risk-aversion over low-probability losses
- risk-aversion over high-probability gains
- risk-seeking over high-probability losses

Reflection of risk attitude: over low and high probability, and over loss and gain.

Gambles examined in HK&V's study

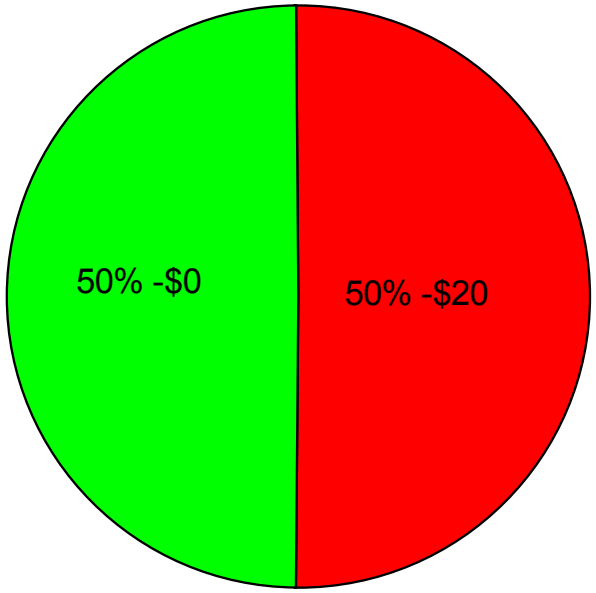
#	Prob.	Payoff	Expected Value	FFP Prediction
1	.1	+ $20	+ 2	Seeking
2	.4	+ $20	+ 8	Neutral
3	.8	+ $20	+ 16	Averse
4	.1	- $20	- 2	Averse
5	.4	- $20	- 8	Neutral
6	.8	- $20	- 16	Seeking

Experimental procedures

- Probability presented both by spinner and as probability
- Elicitation of preferences:
- Choice-based procedure (Harbaugh et al., 2000).
  - chose between gamble and its expected value
- Price-based procedure: Report maximum willingness to pay
  - to play a gamble over gains
  - to avoid playing a gamble over losses.
  - BDM procedure to determine whether subjects get risky prospect or pay the randomly determined price to play the gamble (gain), or avoid the gamble (loss)

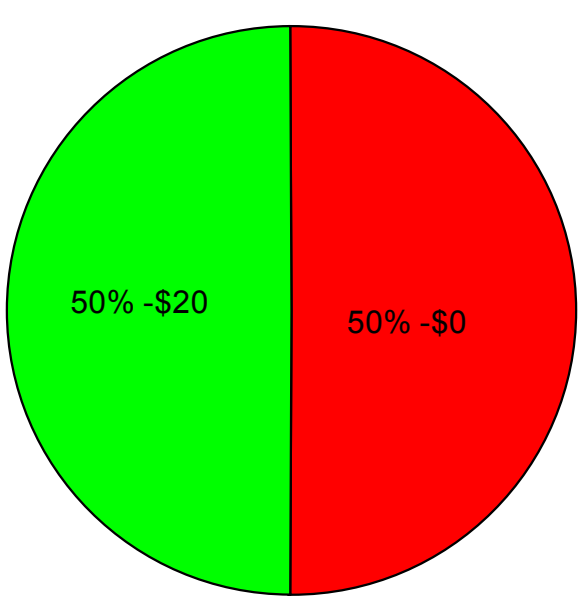
- Participants: 96 college students
  - 64 use the choice method first and price method second (choice-subjects)
  - 32 use the price method first and choice method second (price-subjects)

How much would you pay to avoid playing this game?



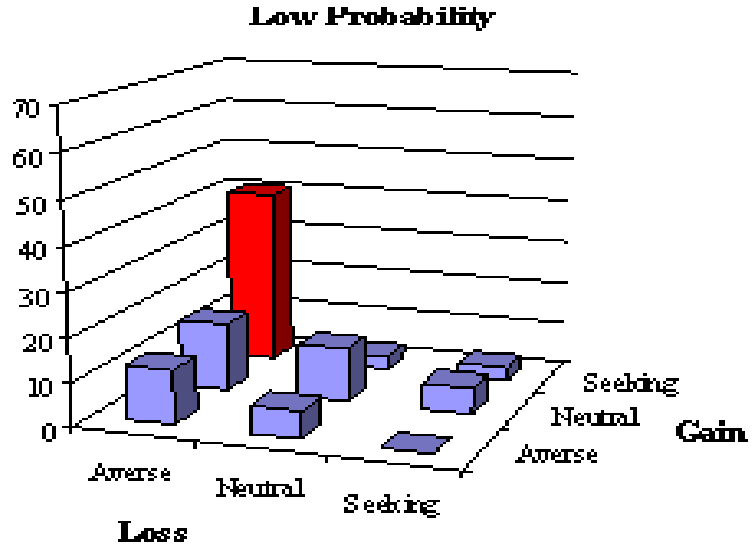
SAMPLE

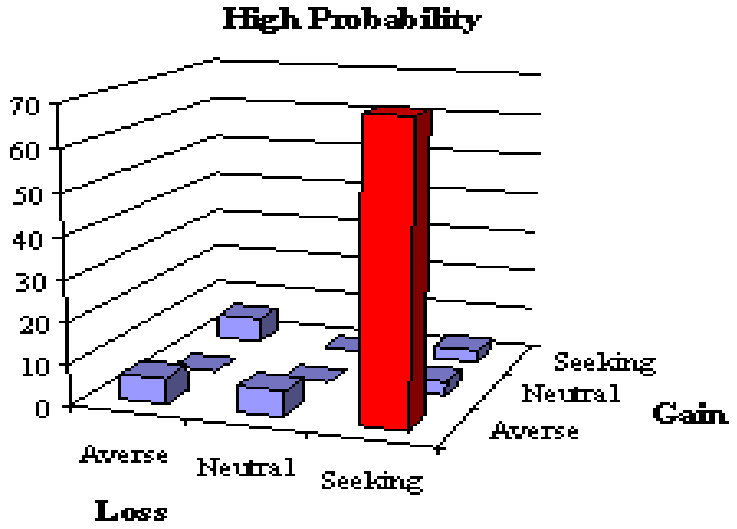
No Spin,
- $10

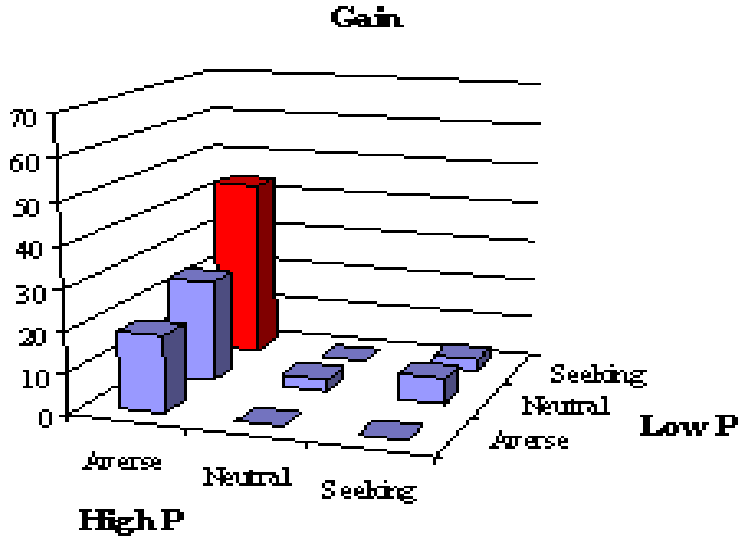


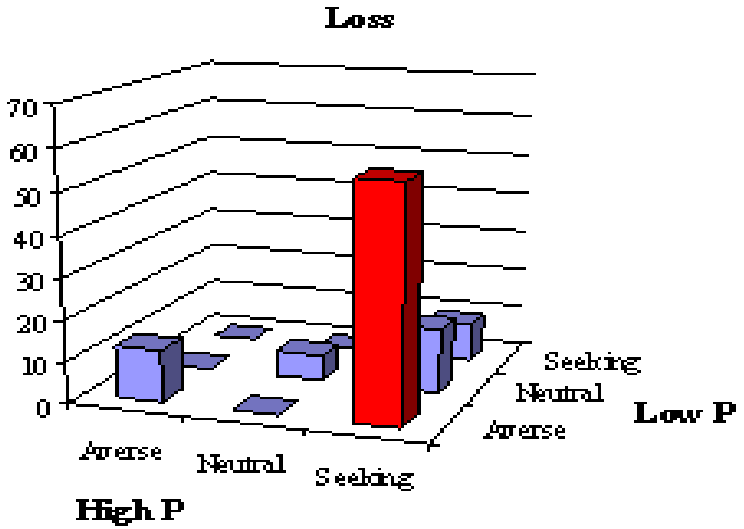
SAMPLE

Risk Attitudes of Price-subjects in the Price Task (N=32)

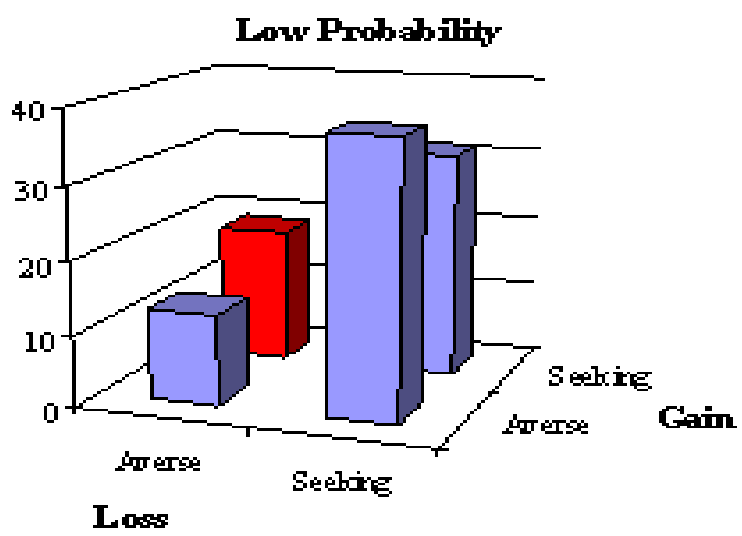


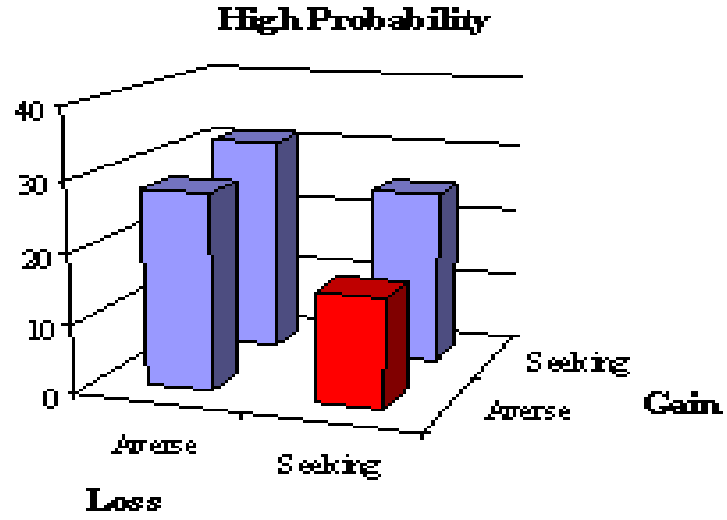


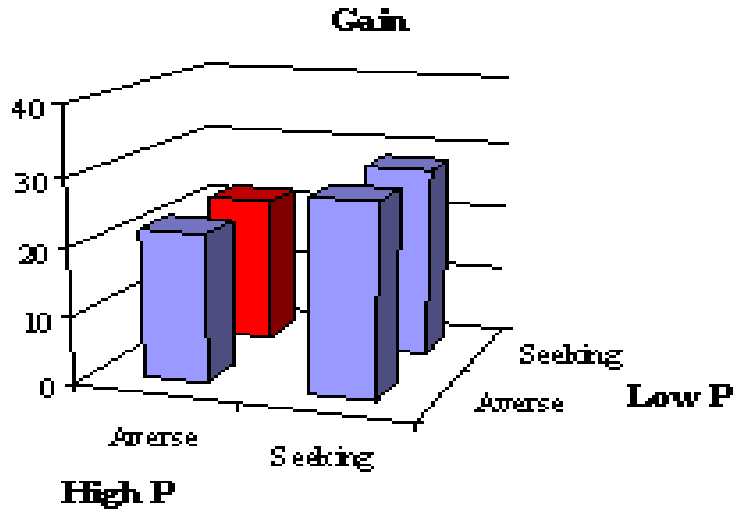


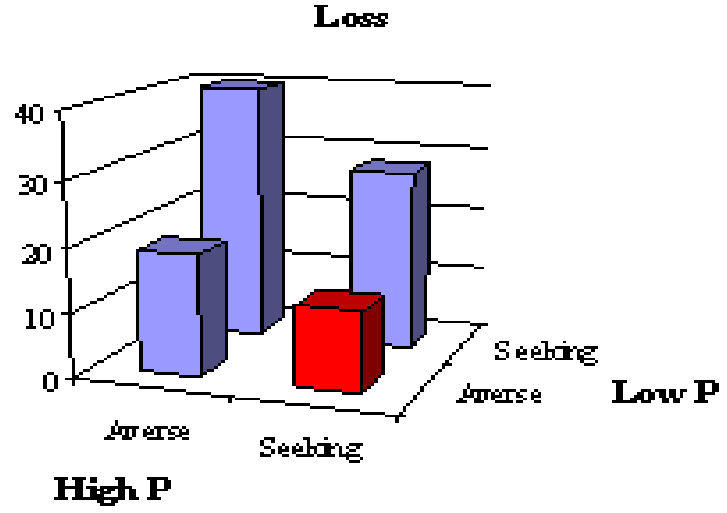


Risk Attitudes of Choice-subjects in Choice Task (N=64)









Conclusions

So HK&V find they can ***reverse*** prospect theory's fourfold pattern of risk attitudes for high and low probabilities and gains and losses.

The reversal is accomplished by changing the way preferences are interrogated: prices versus choices

So just as utility theory is somewhat fragile, so is prospect theory.

Experience versus description

- Similarly, Ralph Hertwig, Greg Barron, Elke U. Weber, and Ido Erev, in "Decisions from Experience and the Effect of Rare Events in Risky Choices." Psychological Science 15, 2004 look at choices over gambles in three conditions, which they call
- **Description**: The Description condition is the condition used by Kahneman and Tversky. The subjects were presented with a description of the problems and state which gamble they prefer in each problem.
- **Feedback**: In the Feedback condition, participants did not see the description of the gambles. Rather, they were presented with two unmarked keys select one of them. Each selection led to a draw from the keys payoff distributions (a play of the relevant gambles).
- **Sampling**: “In the Sampling condition participants were told that their goal is to select once between two gambles. They did not see a description of the gambles, but were allowed to sample as many time as they wish the relevant payoff distributions. Thus, like in Feedback they had to make decisions from experience, but like in Description they make a single choice.”

HBW&E also find that CPT's overweighting of small probabilities and underweighting of large probabilities occurs only in the description condition.

Problem 1: Choose between

Option	Outcome & likelihood	Description	Feedback	Sampling
H	4 w. pr. 0.8 0 otherwise	35%	65%	88%
L	3 for sure			

Problem 2: Choose between

Option	Outcome & likelihood	Description	Feedback	Sampling
H	4 w. pr. 0.2	68%	51%	44%
	0 otherwise			
L	3 w. p. 0.25			
	0 otherwise			

So, there are systematic departures from simple models of rational choice. But it is hard to find general descriptive models. The same tools used to show that e.g. utility theory isn't a general description seem to work well on prospect theory too.

Lessons learned

To the extent that utility theory is a useful approximation, it is likely to be ***least*** useful when

- Estimating parameters from one domain to another (ranges of payoffs, response modes, etc.)
- Dealing with probabilities near 0 and 1
- Aggregating across different “mental accounts” (gains and losses, sunk costs, etc.)
- Comparing different choice modalities (choosing vs. pricing, framing, experience vs. description…)
- Dealing with unfamiliar choices

- These issues are “volatile,” and turn out to be hard to represent even with more parameters.

- As experimenters, we need to be aware that it may be hard to generalize results across volatile boundaries…