Prospect Theory

Kahneman and Tversky, "Prospect Theory: An Analysis of Decision Under Risk." *Econometrica*, March 1979, vol 47, p263—291.

- Noted another difference between Gains versus Losses
- Consider these options:

Example 4:

Gamble G		Gamble H			Gamble $G\prime$		Gamble $H\prime$	
x	p	x	p		x	p	x	p
6000	0.25	4000	.25	versus	−6000	.25	−4000	.25
		2000	.25				−2000	.25
n=18		n=82			n=70		n=30	

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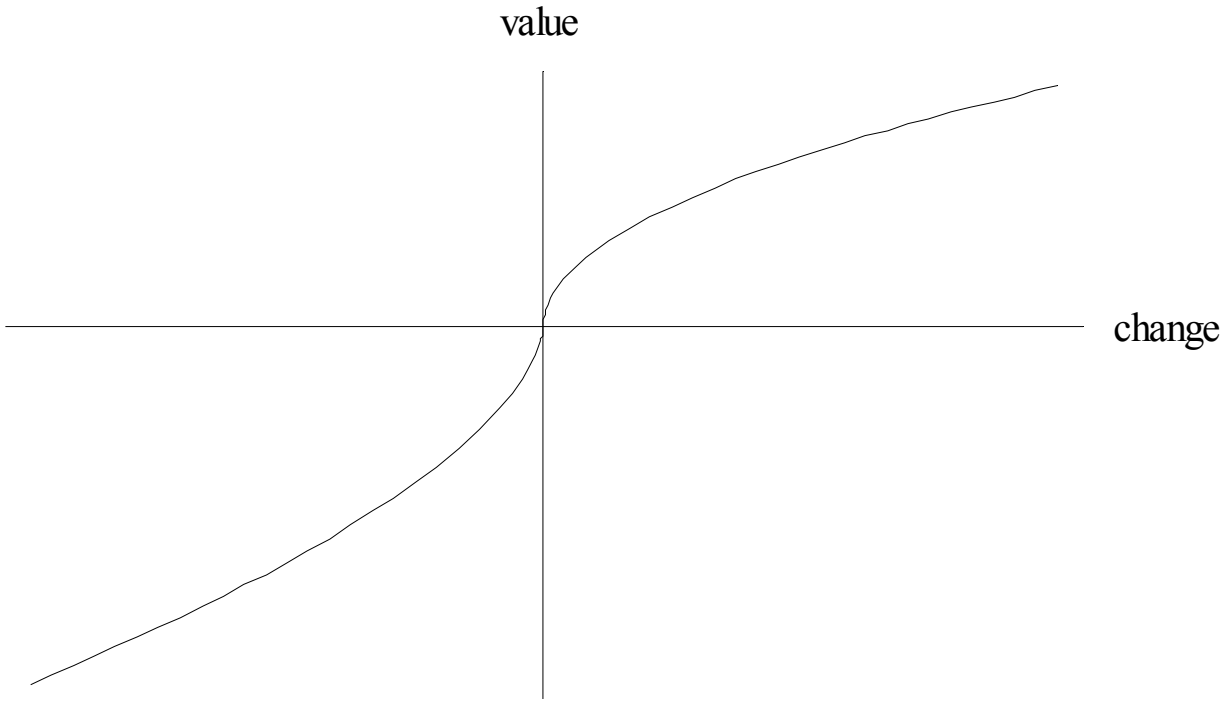
- Gambles *G* and *H* imply that u(6000) < u(4000) + u(2000) which is consistent with concavity of utility in gains.
- But *G'* and *H'* imply that u(−6000) > u(−4000) + u(−2000), which is consistent with utility being convex in losses. That is, Utility is S − shaped with a possible kink at zero gains or losses.

- So the utility map needs to look like this:



Things to note:

- The theory has now been restated as preferences over gains and losses, not over final consumption.
- The data seem to suggest that EU doesn't quite hold – we get fanning out. So Subjective EU seems to fit the data better.
- People seems to be risk averse over small gains, but risk loving over small losses.
- But,…most of this work was done with either small gambles or hypothetical gambles.
- This raises the question of do we still see problems with bigger, real gambles.

Second Demonstration: On each line choose either option A or option B.

Number your card from 1 to 10 and make a choice for each line.

Option A	Option B
1/10 of $2.00, 9/10 of $1.60	1/10 of $3.85, 9/10 of $0.10
2/10 of $2.00, 8/10 of $1.60	2/10 of $3.85, 8/10 of $0.10
3/10 of $2.00, 7/10 of $1.60	3/10 of $3.85, 7/10 of $0.10
4/10 of $2.00, 6/10 of $1.60	4/10 of $3.85, 6/10 of $0.10
5/10 of $2.00, 5/10 of $1.60	5/10 of $3.85, 5/10 of $0.10
6/10 of $2.00, 4/10 of $1.60	6/10 of $3.85, 4/10 of $0.10
7/10 of $2.00, 3/10 of $1.60	7/10 of $3.85, 3/10 of $0.10
8/10 of $2.00, 2/10 of $1.60	8/10 of $3.85, 2/10 of $0.10
9/10 of $2.00, 1/10 of $1.60	9/10 of $3.85, 1/10 of $0.10
10/10 of $2.00, 0/10 of $1.60	10/10 of $3.85, 0/10 of $0.10

Holt and Laury, 2002

- We need accurate measure of risk aversion – for every kind of economics. But experimental measures are typically only collected with small stakes. Doesn't give us measures of curvature over large stakes.
- Psychologists say no problem, do hypothetical large stakes. People are imaginative enough to understand what they will do, and also will answer honestly.
- H & L test this claim directly.

TABLE 1—THE TEN PAIRED LOTTERY-CHOICE DECISIONS WITH LOW PAYOFFS

Option A	Option B	Expected payoff difference
1/10 of $2.00, 9/10 of $1.60	1/10 of $3.85, 9/10 of $0.10	$1.17
2/10 of $2.00, 8/10 of $1.60	2/10 of $3.85, 8/10 of $0.10	$0.83
3/10 of $2.00, 7/10 of $1.60	3/10 of $3.85, 7/10 of $0.10	$0.50
4/10 of $2.00, 6/10 of $1.60	4/10 of $3.85, 6/10 of $0.10	$0.16
5/10 of $2.00, 5/10 of $1.60	5/10 of $3.85, 5/10 of $0.10	−$0.18
6/10 of $2.00, 4/10 of $1.60	6/10 of $3.85, 4/10 of $0.10	−$0.51
7/10 of $2.00, 3/10 of $1.60	7/10 of $3.85, 3/10 of $0.10	−$0.85
8/10 of $2.00, 2/10 of $1.60	8/10 of $3.85, 2/10 of $0.10	−$1.18
9/10 of $2.00, 1/10 of $1.60	9/10 of $3.85, 1/10 of $0.10	−$1.52
10/10 of $2.00, 0/10 of $1.60	10/10 of $3.85, 0/10 of $0.10	−$1.85

A is safe, B is risky.

Expected Pay difference is the amount in favor of A.

Go down the chart and the additional payoff for taking the riskier B option steadily increases.

Everyone should start out at A, eventually switch over to B.

A risk neutral person would maximize expected value, switch at 5.

A risk averse person will switch later – Safe A has to get really bad, compared to risk B, for them to switch.

Innovation is to do this experiment hypothetically, and with large amounts - $100's.

TABLE 2—SUMMARY OF LOTTERY-CHOICE TREATMENTS

Treatment	Number of subjects	Average earnings	Minimum earnings	Maximum earnings
20x Hypothetical Only	25	$ 25.74	$ 19.40	$ 40.04
20x Real Only	57	$ 67.99	$ 20.30	$116.48
20x Hypothetical and Real	93	$ 68.32	$ 11.50	$105.70
50x Hypothetical and Real	19	$131.39	$111.30	$240.59
90x Hypothetical and Real	18	$226.34	$ 45.06	$391.65

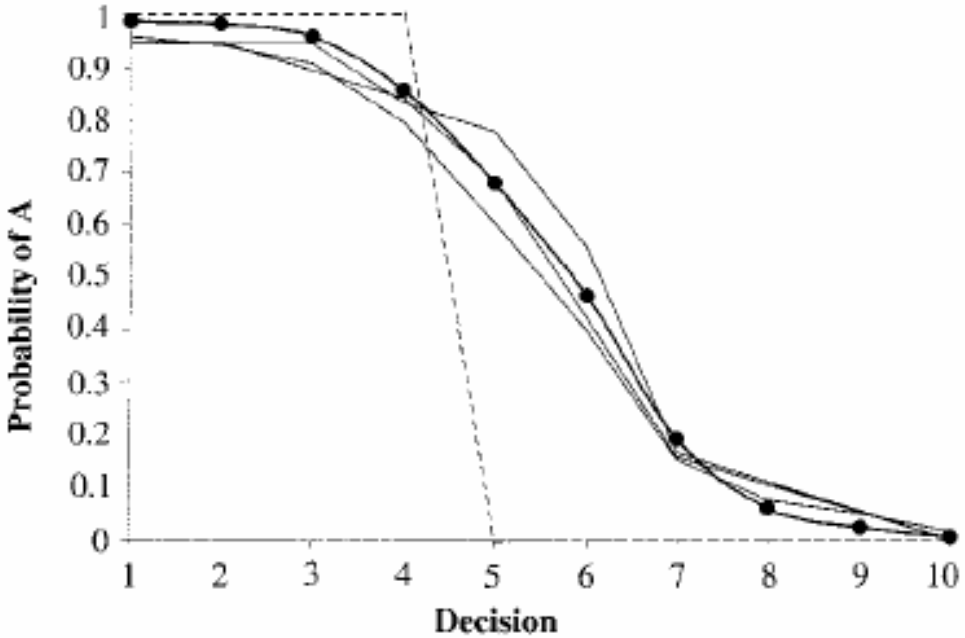


FIGURE 1. PROPORTION OF SAFE CHOICES IN EACH DECISION: DATA AVERAGES AND PREDICTIONS

Note: Data averages for low real payoffs [solid line with dots], 20x, 50x, and 90x hypothetical payoffs [thin lines], and risk-neutral prediction [dashed line].

TABLE 3—RISK-AVERSION CLASSIFICATIONS BASED ON LOTTERY CHOICES

Number of safe choices	Range of relative risk aversion for $U(x) = x^{1-r}/(1-r)$	Risk preference classification	Proportion of choices		
			Low real[a]	20x hypothetical	20x real
0–1	$r < -0.95$	highly risk loving	0.01	0.03	0.01
2	$-0.95 < r < -0.49$	very risk loving	0.01	0.04	0.01
3	$-0.49 < r < -0.15$	risk loving	0.06	0.08	0.04
4	$-0.15 < r < 0.15$	risk neutral	0.26	0.29	0.13
5	$0.15 < r < 0.41$	slightly risk averse	0.26	0.16	0.19
6	$0.41 < r < 0.68$	risk averse	0.23	0.25	0.23
7	$0.68 < r < 0.97$	very risk averse	0.13	0.09	0.22
8	$0.97 < r < 1.37$	highly risk averse	0.03	0.03	0.11
9–10	$1.37 < r$	stay in bed	0.01	0.03	0.06

[a] Average over first and second decisions.

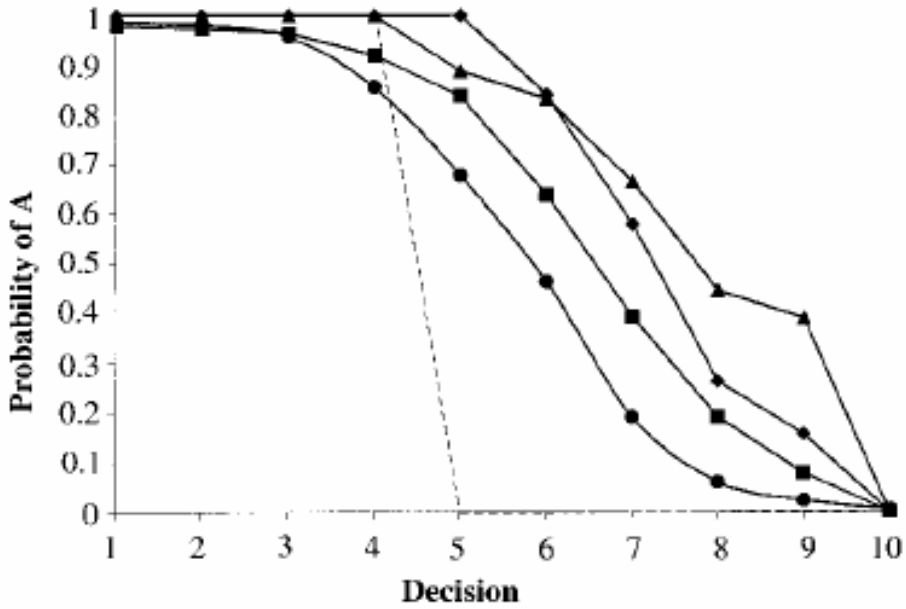


FIGURE 2. PROPORTION OF SAFE CHOICES IN EACH DECISION: DATA AVERAGES AND PREDICTIONS

Note: Data averages for low real payoffs [solid line with dots], 20x real [squares], 50x real [diamonds], 90x real payoffs [triangles], and risk-neutral prediction [dashed line].

Conclusions:

- Even with prizes < $4, some risk aversion
- Sharp increases in aversion, with larger payoffs.
- *No change* when hypothetical payoffs are increased.
- People general *underestimate* their actual risk aversion. This means that hypothetical tests will exaggerate risk aversion.

- So real vs. hypothetical matters. People really are risk averse, and risk aversion increases as the stakes increase.
- This raises the possibility that a lot of the issues and data we've gotten from prior studies could be misleading because the gambles were small or hypothetical.