Lecture 6
Prospect Theory and Reference Points
(预期理论与参考点)

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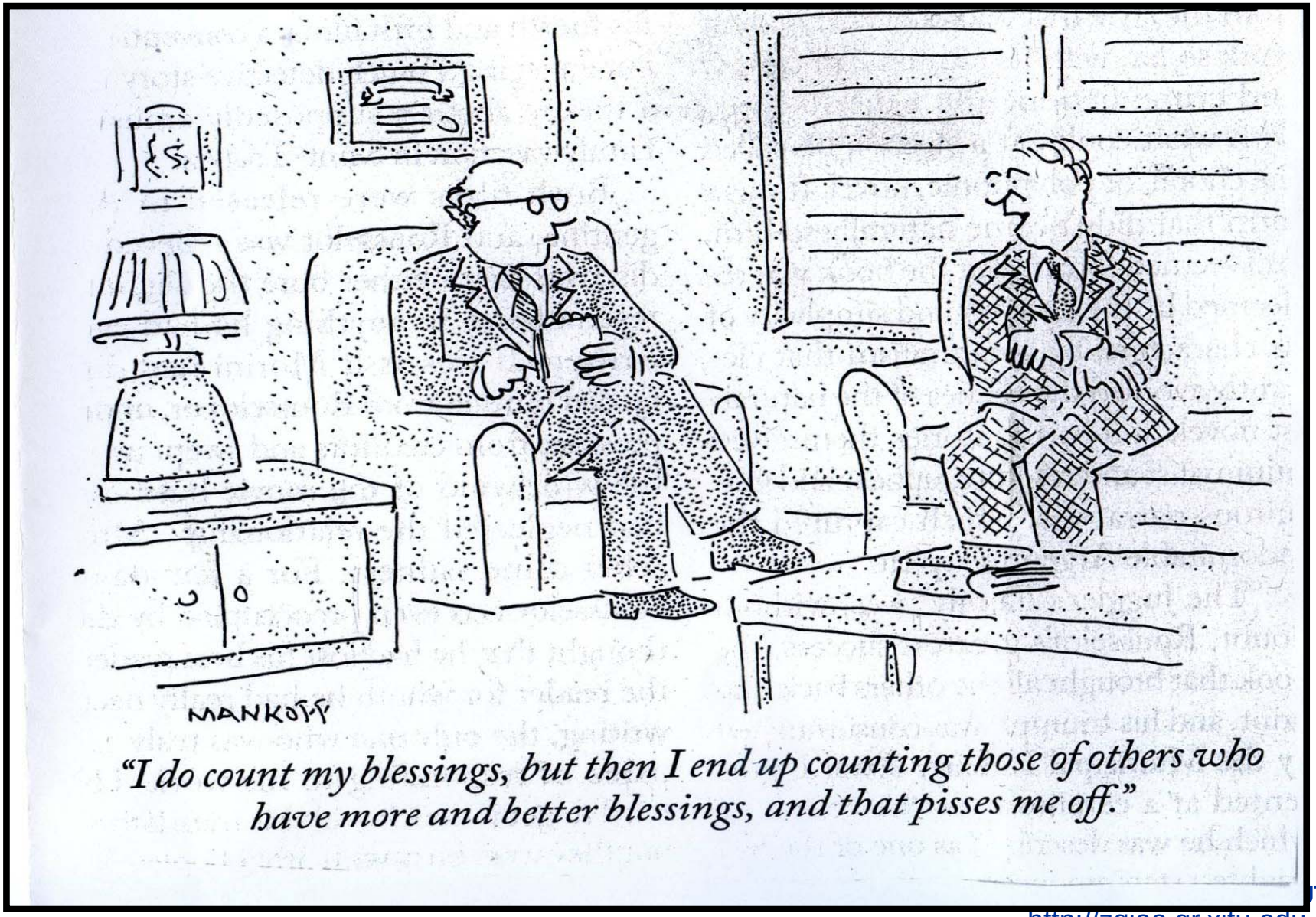
Introduction



Introduction

Please estimate the average number of hours you watch television per week:

1-4 ____ 5-8 ____ 9-12 X 13-16 ____ 17-20 ____ More than 20 ____

Please estimate the average number of hours you watch television per week:

1-2 ____ 3-4 ____ 5-6 X 7-8 ____ 9-10 ____ More than 10 ____

Introduction

Charitable Giving: *I'll give if everyone's giving (*Karlan, List 2004)

- Group 1: "46% of your peers gave"
- Group 2: "64% of peers gave"
- Group 3 not given any reference point

- Result: group 2 gave 12% more than other groups

•*We like to be normal and it helps if we know what the "norm" is.*

Introduction

A story from the field

2008 Savers	
Jill M- $200	Mandy K- $175
Frank T- $190	Corey B- $140
Kelly P- $300	JD- $200

- Increase number of people saving? (*Descriptive Norms*)
- Increase amount of people are saving? (*Reference Points*)

Prospect Theory

- Expected Utility Theory
  - Decision making: a choice between prospects
    - Expectation
    - Asset Integration
    - Risk Aversion

Prospect Theory

- Problem 1

A:	2,500 with probability	.33,	B:	2,400 with certainty.	
	2,400 with probability	.66,			
	0 with probability	.01;			
$N = 72$	[18]			[82]*	

- EUT: $u(2400) > 0.33u(2500) + 0.66u(2400)$ ➔ $0.34u(2400) > 0.33u(2500)$

- Problem 2

C:	2,500 with probability	.33,	D:	2,400 with probability	.34,
	0 with probability	.67;		0 with probability	.66.
$N = 72$	[83]*			[17]	

- EUT: 0.33u(2500) > 0.34 u(2400)

Prospect Theory

- Problem 3

A: (4,000,.80), or B: (3,000).

$N = 95$ [20] [80]*

- EUT: $u(3000) > u(3200)$

- Problem 4

C: (4,000,.20), or D: (3,000,.25).

$N = 95$ [65]* [35]

- EUT: $u(800) > u(750)$

Prospect Theory

- Prospect Theory
  - Kahneman & Tversky(1979)
  - Two Phases in the choice process
    - Editing Phase: analysis of the offered prospects
    - Evaluation Phase: prospects are evaluated and chosen

Prospect Theory

- Prospect Theory
  - Editing Phase
    - Coding: people perceive outcomes as gains or losses relative to some reference point, which can be affected by the formulation of the offered prospects, and by the expectations of the decision maker.
    - Combination: prospects can sometimes be simplified by combining the probabilities associated with identical outcomes. E.g. (200, .25; 200, .25)→(200, .5).
    - Segregation: some prospects contain a riskless component that is segregated from the risky component. E.g. (300, .80; 200, .20)→(100, .80).

Prospect Theory

- Prospect Theory
  - Editing Phase
    - Cancellation (applied to more prospects)
      - Discard components that are shared by the offered prospects.
      - Discard common constituents, i.e., outcome-probability pairs.
      - E.g. (200, .20; 100, .50; -50, .30) and (200, .20; 150, .50; -100, .30)→(100, .50;-50, .30) and (150,.5 ; -100; .30).
    - Simplification(applied to more prospects)
      - Simplification of prospects by rounding probabilities or outcomes.(99, 0.51)→(100, 0.5)

Prospect Theory

- Prospect Theory
  - Editing Phase
    - Detection of Dominance
      - Scan offered prospects to detect dominated alternatives and rejected some prospects without further evaluation. (200,0.3; 99,0.51) and (200,0.4; 101,0.49) if second components are rounded to (100,0.5), the second prospect is dominates the first.

Prospect Theory

- Prospect Theory
  - Editing Phase
    - Many anomalies of preference result from the editing of prospects, i.e., the inconsistencies associated with the isolation effect result from the cancellation of common components.
    - The preference order between prospects need not be invariant across contexts, because the same offered prospect could be edited in different ways depending on the context in which it appears.

Prospect Theory

- Prospect Theory
  - Evaluation Phase
    - Evaluate each of the edited prospects and choose the prospect of highest value.
      - V: Overall value of an edited prospect
      - x or y: outcome
      - p: probability of an edited prospect
      - π: scale of p (impact of p on V)
      - v: subjective value of x, measures the value of deviations from the reference point.

Prospect Theory

- Prospect Theory
  - Evaluation Phase
    - $v(x)= (x\text{-}r)^{\alpha}$ if $x \geq r$
      $v(x)= (x\text{-}r)^{\beta}$ if $x < r$
    - $\pi(p)=p^{\gamma}/(p^{\gamma} + (1\text{-}p)^{\gamma})^{1/\gamma}$

Prospect Theory

- Prospect Theory
  - Evaluation Phase
    - Form of simple prospects $(x, p; y, q)$
    - Receive nothing with probability $1\text{-}p\text{-}q$

Prospect Theory

- Prospect Theory
  - Evaluation Phase
    - For a regular prospect ($p+q<1$ or $x>=0>=y$)
    - $V=\pi(p)v(x)+\pi(q)v(y)$
    - This generalizes expected utility theory by relaxing the expectation principle.

Prospect Theory

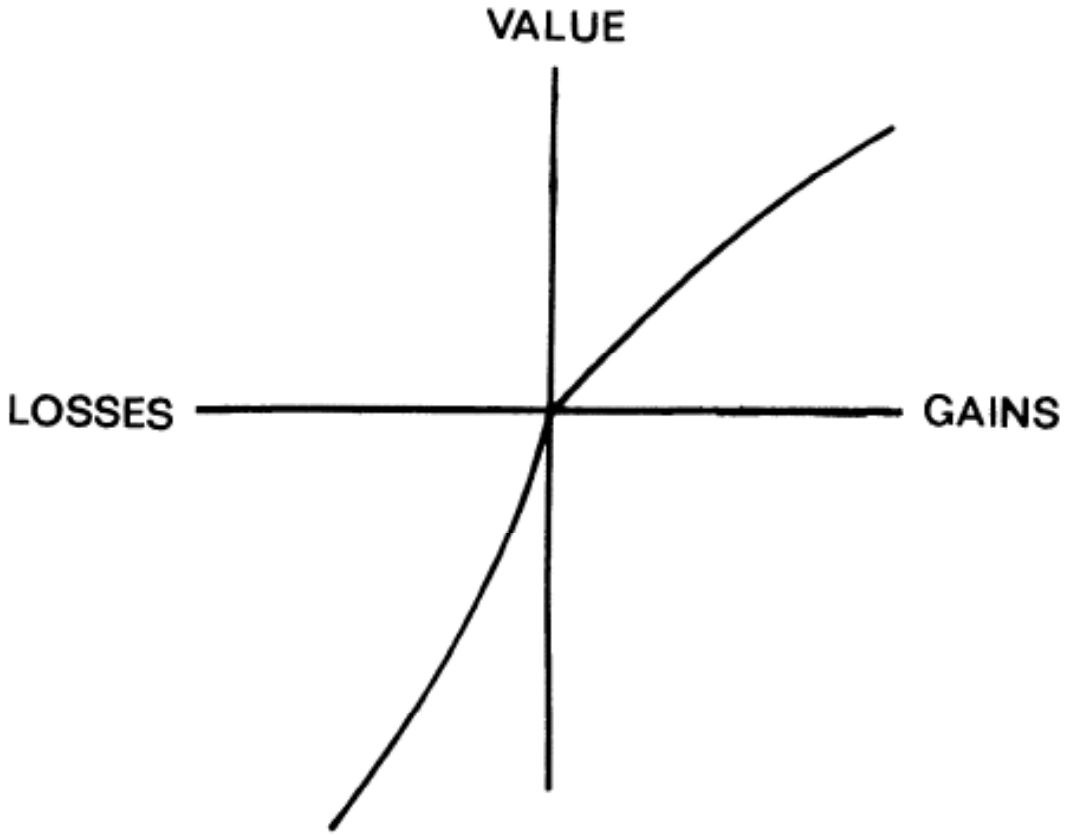
- Prospect Theory
  - Evaluation Phase
    - For strictly positive and negative prospects, they are segregated into two components
    - The riskless component
    - The risky component
    - If p+q=1 and either x>y>0 or x<y<0 then
    - $V=v(y)+\pi(p)[v(x)-v(y)]$ or
    - $V=\pi(p)v(x)+[1-\pi(p)]v(y)$ (similar to the general case)

Prospect Theory

- Prospect Theory
  - Retain the bilinear form of expected utility theory
  - Assume values are attached to changes rather than to final states
  - Decision weights do not coincide with stated probabilities
  - Can lead to normatively anomalies, such as inconsistencies, intransitivities, and violations of dominance
  - A decision maker does not have the opportunity to discover his preferences could violate decision rules that he wishes to obey.

Prospect Theory

- Prospect Theory
  - The Value Function



Prospect Theory

- Prospect Theory
  - The Value Function
    - Defined on deviations from the reference point
    - Generally concave for gains and commonly convex for losses
    - Steeper for losses than for gains

Reference Points

- Nature
  - Value variable *v* measures the value of deviations from a reference point.
- Psychological Foundation
  - Homeostasis: various systems in the body have an optimal set point, and deviations from this point trigger negative feedback that attempt to restore it.
  - Allostasis: a variable is maintained within a healthy range, but at the same time is allowed to vary in response to environmental demands.
  - E.g. Experiment of using hands to feel water temperature.

Reference Points

- Empirical Evidence
  - Happiness Treadmill
    - The average income in US has increased by more than 40% since 1970s. Wealth Americans regularly report they are not happier.
    - Suicide rats in rich countries are higher than in poor countries.
  - Imagine a person who already lost 2000, and is now facing a choice between a sure gain of 1000 and an even chance to win 2000 or nothing.
    - (2000, 0.5) and (1000) for a person without 2000 lose.
    - (-2000,0.5) and (-1000)

Reference Points

- Reference-dependent preferences → loss aversion
  - $U(c|r)=m(c)+n(c|r)$
  - $m(c)$: consumption utility
  - $n(c|r)$: gain-loss utility
- Reference Point
  - Is the probabilistic beliefs a person held in the recent past about outcomes
  - Other explanation: Status Theory
    - – People expect to maintain the status

Reference Points

- Reference-dependent preferences → loss aversion
  - Gain-loss utility: $n(c|r)=\mu(m(c)-m(r))$

Reference Points

- Applications
  - Shopping
  - Taxi Driving

Reference Points

- Expectation can act as a reference
- Expectation based, reference-dependent preferences are difficult to test
- Question: how to test what determines the reference point?
  - Abeler, Falk, Geotte, Huffman(AER 2011)

Experiment Design

- Task
  - To count number of zeros in the tables with 150 randomly ordered zeros and ones
- Stages
  - First: 4 minutes, piece rate of $0.1
    To familiarize subject with the work
  - Second:
    - Subjects can decide how long to work
    - Choose two envelopes
      Get acquired earnings (piece rate of $0.2)
      Get fixed earnings (known in advance)

Experiment Design

- Treatments
  - LOW: $3 fixed payment
  - HI: $7 fixed payment
- Procedure
  - Subjects arrived one at a time with 20 minutes separation
  - Subjects were guided to 3 identical, neutral rooms
  - To avoid peer effect and a desire for conformity
- Conduct
  - 60 subject in each treatment
  - Average earning: $8.7

Theoretical Predictions

- Status Theory
  - No treatment difference
  - Because status is the same across the treatments
- Expectation Based Reference-dependence
  - Average effort is higher in the HI treatment than in the LOW treatment
  - The probability to stop at $we=f_{LOW}$ is higher in the LOW treatment than in the HI treatment
  - The probability to stop at $we=f_{HI}$ is higher in the HI treatment than in the LOW treatment

Results

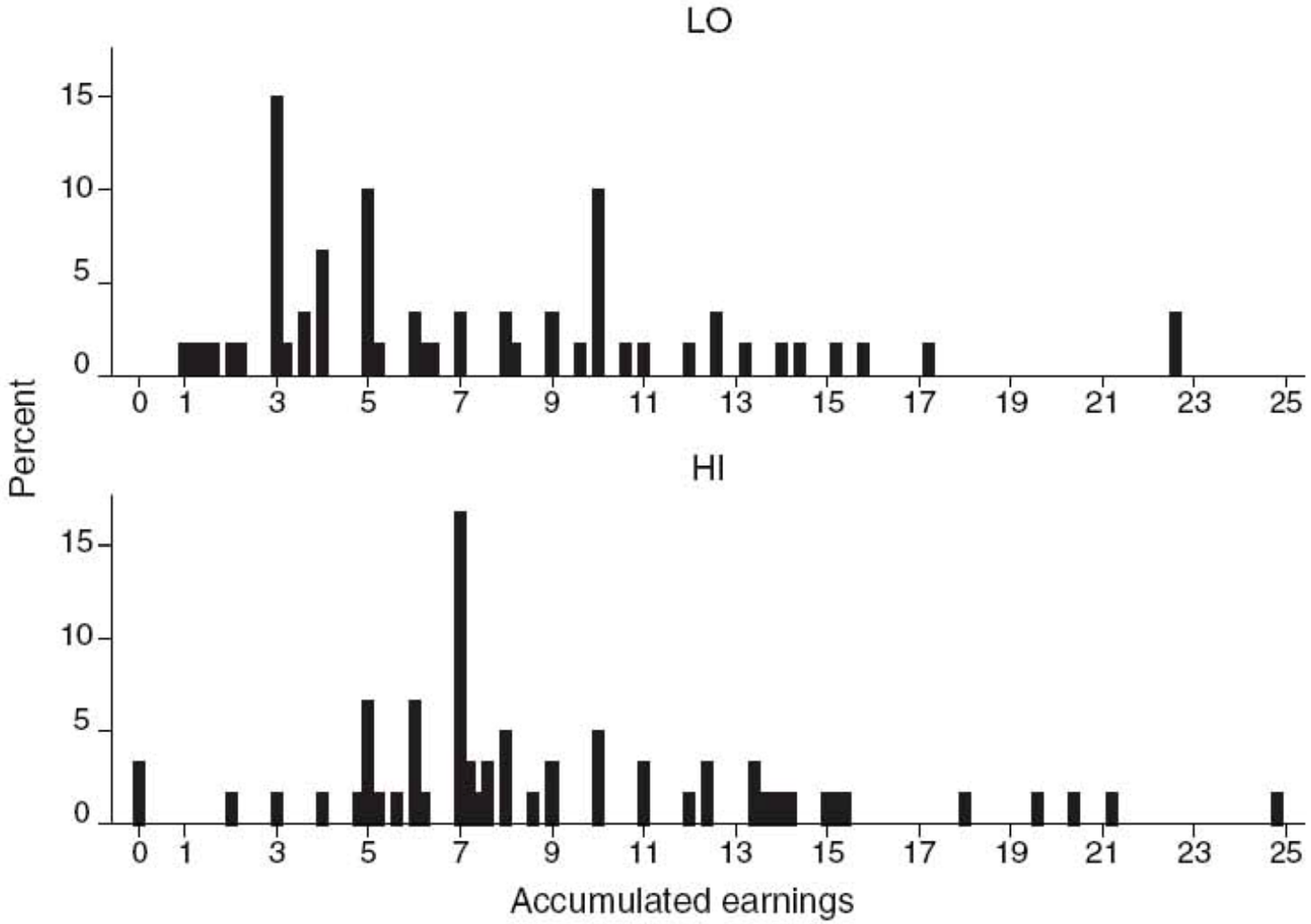
- Subjects in the HI treatment work significantly more than subjects in the LOW treatment.

	OLS: Accumulated earnings			OLS: Time spent working (in min.)			Tobit: Time spent working (in min.)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1 if HI treatment	1.850**	1.942**	1.973**	6.430**	6.572**	6.784**	7.927**	8.091**	8.442**
	(0.917)	(0.885)	(0.900)	(3.163)	(3.153)	(3.231)	(3.841)	(3.814)	(3.833)
Productivity		0.059***	0.064***		0.091	0.096		0.098	0.103
		(0.019)	(0.020)		(0.067)	(0.070)		(0.080)	(0.083)
1 if Female			−0.039			1.619			1.577
			(0.950)			(3.412)			(4.035)
Controls for temperature	No	No	Yes	No	No	Yes	No	No	Yes
Controls for time of day	No	No	Yes	No	No	Yes	No	No	Yes
Constant	7.370***	10.607***	10.200***	31.715***	36.713***	34.362***	33.004***	38.389***	35.306***
	(0.648)	(1.206)	(1.445)	(2.237)	(4.297)	(5.190)	(2.697)	(5.143)	(6.116)
Observations	120	120	120	120	120	120	120	120	120
Adjusted or Pseudo R^2	0.03	0.09	0.08	0.03	0.03	0.00	0.00	0.01	0.01

Results

- The probability to stop when accumulated earnings are equal to the amount of the fixed payment is higher compared to the same earnings level in the other treatment. The modal choice in both treatments is to stop exactly when accumulated earnings equal the fixed payment

Results


LO
HI
Percent
15
10
5
0
0 1 3 5 7 9 11 13 15 17 19 21 23 25
Accumulated earnings