Action

The psychology of choice

Assumptions of Neoclassical Economics ("*Homo Economicus*")

- Selfishness – an individual chooses on the basis of his/her own interests (no true, systematic altruism)
- Stable, exogenous preferences – what the individual wants is well-defined, available to introspection, and stable over time
- Formal rationality – an individual's preferences, tastes, etc. are consistent with each other

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Rational Choice Theories for Individuals

- Utility theory – one agent, choice depends only on states of nature

Example: A decision that depends on states of nature

- Options:
  - Plan picnic outdoors
  - Plan picnic indoors
- Possible states of nature
  - Rain
  - No rain
- Choice depends on likelihood of rain, relative quality of picnic indoors/outdoors with and without rain

Rational Choice Theories for Individuals (Von Neumann and Morgenstern, 1944)

- Utility theory – one agent, choice depends only on states of nature

- Game theory – more than one agent, choice depends on what other agents may choose

Example: a decision that depends on what others may do

- Options:
  - Go to the beach
  - Go to the cinema
- Your friend may choose to:
  - Go to the beach
  - Go to the cinema
- You cannot control or know what your friend will do
- Both of you know each other's preferences
- Choice depends on what you think your friend will do, which depends on what s/he thinks you will do, and so on…

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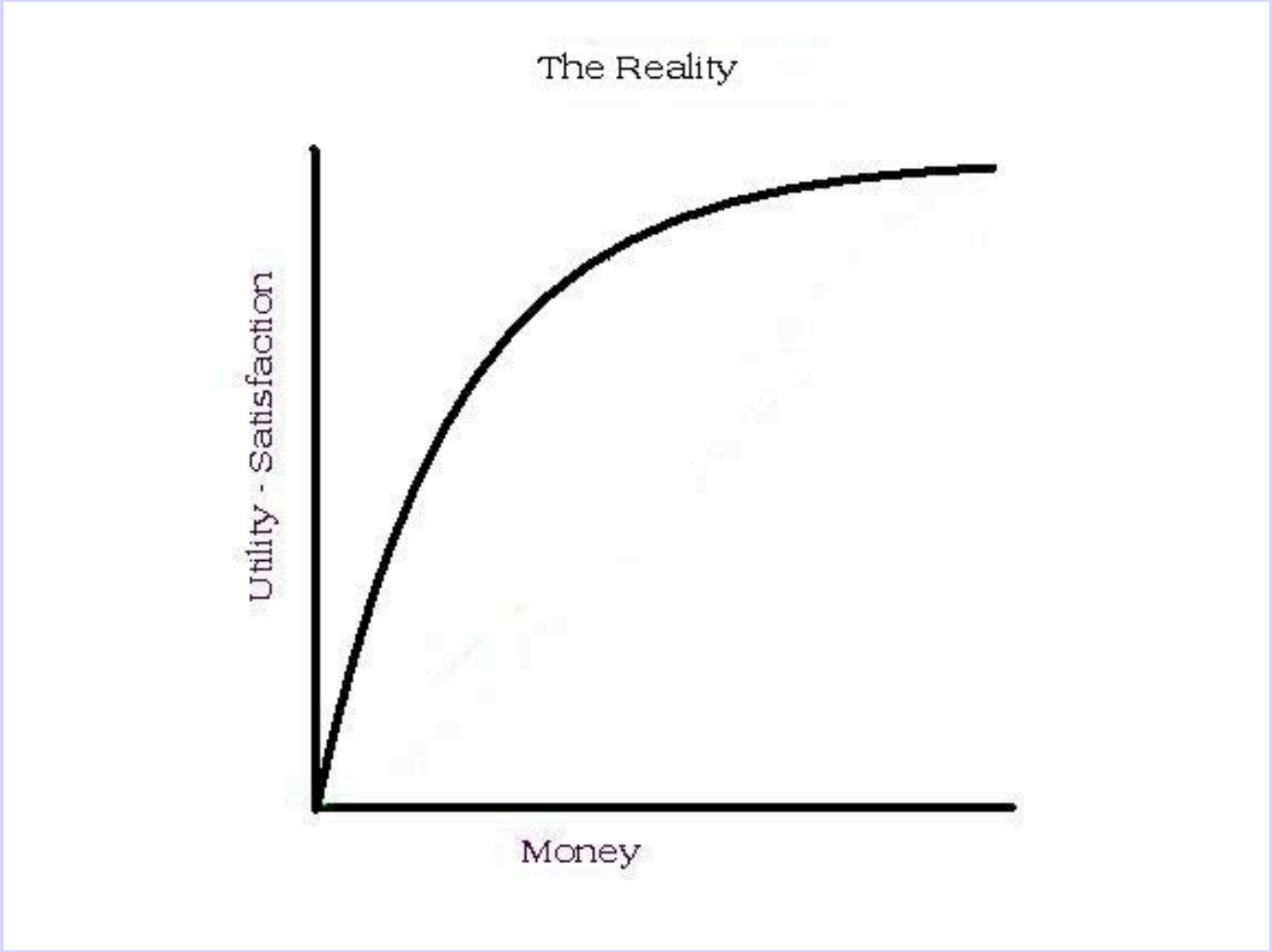
  - Expected utility is a probability-weighted combination of the utilities of all *n* possible outcomes O_i

$$\sum_{i=1}^{n} U(O_i)P(O_i)$$

A Concave Utility Curve



Example: Application of Utility Theory

- Options:
  - Gamble (50% chance to win $100; else $0)
  - Sure Thing (100% chance to win $50)
- Expected *values* are the same:
  - EV(Gamble) = (.5)($100) + (.5)($0) = $50
  - EV(Sure Thing) = (1)($50) = $50
- But their expected *utilities* may still differ
  - EU(Gamble) = .5U($100) + .5U($0)
  - EU(Sure Thing) = U($50)

Expected utility theory says that utilities are…

- Not directly observable (internal to an individual)
- Not comparable across individuals
- Constrained by revealed preferences (i.e. choices between gambles)

Do people's choices obey the theory of expected utility (i.e., formal rationality)?

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Utility versus Preference (Lichtenstein and Slovic, 1971; 1973)

- Ps given two options:
  - P bet: 29/36 probability to win $2
  - $ bet: 7/36 probability to win $9
- Two conditions:
  - Choose one: Most prefer P bet
  - Value the bets: Most value $ bet higher
- Shows utility (based on cash value) is not consistent with revealed preference

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Tests of Transitivity (A. Tversky, 1969)

- Ps shown ratings of college applicants on three dimensions:

Applicant	Intelligence	Stability	Social
A	69	84	75
B	72	78	65
C	75	72	55
D	78	66	45
E	81	60	35

- **Ps chose A over B, B over C, C over D, D over E, but……E over A (difference in intelligence outweighed)**

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Testing Expected Utility (Tversky and Kahneman, 1981)

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  - C. 25% chance to win $30
  - D. 20% chance to win $45

Testing Expected Utility (Tversky and Kahneman, 1981)

- Choose between:
  - A. Sure win of $30 [78 percent]
  - B. 80% chance to win $45 [22 percent]
- Choose between:
  - C. 25% chance to win $30 [42 percent]
  - D. 20% chance to win $45 [58 percent]

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- But this pattern is inconsistent with EUT:
  - EU(A)>EU(B) => u($30)>.8u($45)
  - EU(D)>EU(C) => .25u($30)<.2u($45)
  - Multiply both sides of bottom inequality by 4: contradicts top inequality

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- This is called a “certainty effect”: certain gains have extra psychological value

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  - Contradicted by certainty effect

So, people's choices do not obey formal rationality.

Are their preferences nonetheless stable?

Neoclassical Assumptions About Preferences

- The chosen option in a decision problem should remain the same even if the surface description of the problem changes (descriptive invariance)

A Test of Descriptive Invariance (Tversky and Kahneman, 1981)

- Consider a two-stage game. In the first stage, there is a 75% chance to end the game without winning anything, and a 25% chance to move into the second stage. If you reach the second stage, you have a choice between
  - Sure win of $30
  - 80% chance to win $45
- Your choice must be made before the game starts, i.e. before the outcome of the first stage is known

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  - Sure win of $30 [74 percent]
  - 80% chance to win $45 [26 percent]
- Your choice must be made before the game starts, i.e. before the outcome of the first stage is known

A Test of Descriptive Invariance (continued)

- But this gamble is formally identical to a problem we saw earlier, namely:
  - Choose between:
    - C. 25% chance to win $30 [42 percent]
    - D. 20% chance to win $45 [58 percent]

A Test of Descriptive Invariance (continued)

- But this gamble is formally identical to a problem we saw earlier, namely:
  - Choose between:
    - C. 25% chance to win $30 [42 percent]
    - D. 20% chance to win $45 [58 percent]
- Compare:
  - Consider a two-stage game. In the first stage, there is a 75% chance to end the game without winning anything, and a 25% chance to move into the second stage. If you reach the second stage, you have a choice between
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A Test of Descriptive Invariance (continued)

- But this gamble is formally identical to a problem we saw earlier, namely:
  - Choose between:
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- Compare:
  - Consider a two-stage game. In the first stage, there is a 75% chance to end the game without winning anything, and a 25% chance to move into the second stage. If you reach the second stage, you have a choice between
    - Sure win of $30 [74 percent]
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- A violation of descriptive invariance
- This is known as a “pseudo-certainty” effect: When a stage of the problem is presented as involving a certain gain, it carries extra weight even if getting to that stage is itself uncertain.

Framing Effects (Tversky and Kahneman, 1981)

- Problem 1: Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:
  - If Program A is adopted, 200 people will be saved
  - If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

  Which of the two programs do you favor?
- Problem 2:
  - If Program C is adopted 400 people will die
  - If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

  Which of the two programs do you favor?

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  - If Program A is adopted, 200 people will be saved **[72 percent]**
  - If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved. **[28 percent]**
- Problem 2:
  - If Program C is adopted 400 people will die **[22 percent]**
  - If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die. **[78 percent]**
- But the programs are identical! This example also violates descriptive invariance.
- Shows *reflection effect*: Risk aversion in the domain of gains; risk seeking in the domain of losses

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- The chosen option in a decision problem should remain the same even if the surface description of the problem changes (descriptive invariance)
  - Contradicted by pseudo-certainty and framing effects
- The chosen option should depend only on the outcomes that will obtain after the decision is made, not on differences between those outcomes and
  - the status quo
  - what one expects
  - the overall magnitude of the decision

Status Quo Bias (Kahnemen, Knetsch, and Thaler, 1990)

- “Sellers” each given coffee mug, asked how much they would sell if for
- “Buyers” not given mug, asked how much they would pay for one
- Median values:
  - Sellers: $7.12
  - Buyers: $2.87

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- Median values:
  - Sellers: $7.12
  - Buyers: $2.87
- “Choosers” asked to choose between mug and cash – preferred mug if cash amount was $3.12 or lower, on average
- Shows “endowment effect” – we value what we have; and “loss aversion” – we don’t want to lose it

Mental accounts and expectations (Tversky and Kahneman, 1981)

- Imagine that you have decided to see a play where admission is $20 per ticket. As you enter the theater you discover that you have lost the ticket. The seat was not marked and the ticket cannot be recovered. Would you pay $20 for another ticket?

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- Imagine that you have decided to see a play where admission is $20 per ticket. As you enter the theater you discover that you have lost the ticket. The seat was not marked and the ticket cannot be recovered. Would you pay $20 for another ticket? **[No: 54%]**
- Imagine that you have decided to see a play where admission is $20 per ticket. As you enter the theater you discover that you have lost ***a $20 bill***. Would you still pay $20 for a ticket to the play? **[Yes: 88%]**
- But in both problems, the final outcome is the same if you buy the ticket: you have the same amount of money and you see the play. Why should these cases differ?

Dependence on Ratios (Tversky and Kahneman, 1981)

- Imagine that you are about to purchase a jacket for $250, and a calculator for $30. The calculator salesman informs you that the calculator [jacket] you wish to buy is on sale for $20 [$240] at the other branch of the store, located 20 minutes drive away. Would you make the trip to the other store?
- Results:
  - 68% willing to make extra trip for $30 calculator
  - 29% willing to make extra trip for $250 jacket
- Note: save same amount in both cases: $10. Why the discrepency?

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  - Contradicted by pseudo-certainty and framing effects
- The chosen option should depend only on the outcomes that will obtain after the decision is made, not on differences between those outcomes and
  - the status quo: Contradicted by endowment effect
  - what one expects: Contradicted by mental accounts
  - the overall magnitude of the decision: Contradicted by ratio effect

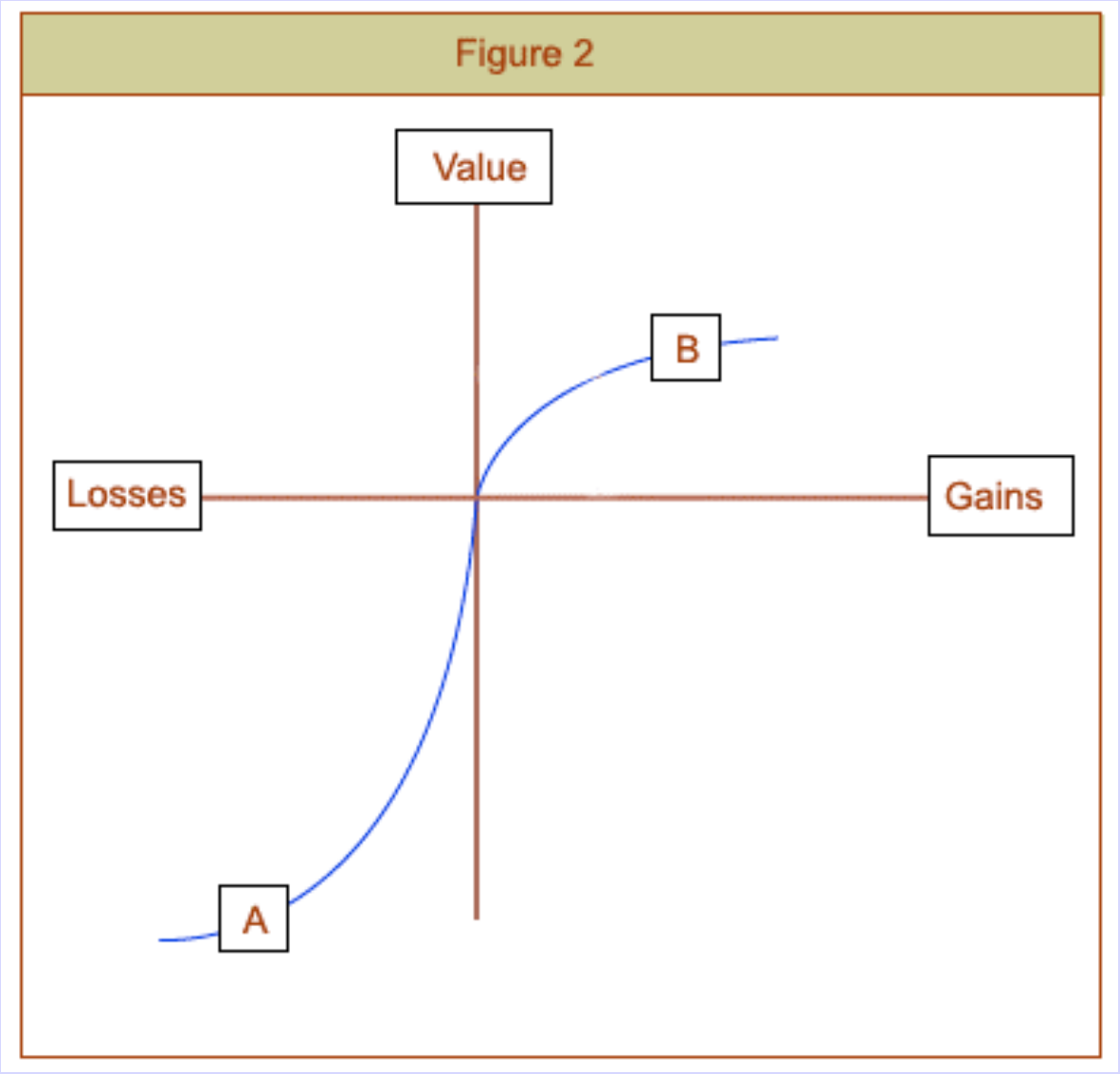
More Neoclassical Assumptions About Preferences

- Preferences over future options should not depend on the transient emotional state of the decision maker at the time of the choice (state independence)
  - Contradicted by projection bias
- Preferences between future outcomes should not vary systematically as a function of the time until the outcomes (delay independence)
  - Contradicted by impulsiveness
- Experienced utility should not differ systematically from
  - decision utility: Contradicted by failures of decision to predict experiences
  - predicted utility: Contradicted by failure to predict adaptation
  - retrospective utility: Contradicted by duration neglect and failure to integrate moment utilities

Prospect Theory (Kahneman and Tversky, 1979; 1992)

- Prospects are evaluated according to a value function that exhibits
  - reference dependence (subjectively oriented around a zero point, defining gains and losses)
  - diminishing sensitivity to differences as one moves away from the reference point
  - loss aversion: steeper for losses than for gains

The Value Function



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- Probabilities are transformed by a weighting function that exhibits diminished sensitivity to probability differences as one moves from either certainty (1.0) or impossibility (0.0) toward the middle of the probability scale (0.5)
  - Refinement of reflection effect: risk *aversion* for medium-to-high probability gains and low probability losses; risk *seeking* for medium to high probability losses and low probability gains

Some everyday, observed consequences of prospect theory (Camerer, 2000)

- Loss aversion:
  - Equity premium in stock market: stock returns too high relative to bond returns
  - Cab drivers quit around daily income target instead of “making hay while sun shines”
  - Most employees do not switch out of default health/benefit plans
  - People at quarter-based schools prefer quarters, at semester-based schools prefer semesters
- Reflection effect:
  - Horse racing: favorites underbet, longshots overbet (overweight low probability loss); switch to longshots at end of the day
  - People hold losing stocks too long, sell winners too early
  - Customers buy overpriced “phone wire” insurance (overweight low probability loss)
  - Lottery ticket sales go up as top prize rises (overweight low probability win)

More serious consequences

- Loss aversion makes individuals/societies unwilling to switch to healthier living (fear loss of income, unsustainable luxuries)
- Risk seeking for likely losses can cause prolonged pursuit of doomed policies, e.g. wars that are not likely to be won, choosing court trial instead of bargaining
- Risk seeking for unlikely gains can lead to excessive gambling in individuals, quixotic policies when leaders get too powerful