Econ 211

Prof. Jeffrey Naecker

Wesleyan University

Kahneman and Tversky (1974): Heuristics and Biases

Motivation

- Probabilities underly nearly all of our daily decisions
  - For example, what is probability that Democrats will control House after 2018 election?
  - However: relatively simple, objective probabilities are difficult for people to calculate (such as the cancer test example for last time)
- Two motivating questions:
  - How do people come up with probability assessments?
  - Do these assessments violate our axioms and main theorems from probability theory?

Leading up to Kahneman and Tversky

- Up until this point (and largely still), most research in economics assumed that individuals could calculate probabilities easily and accurately
- State of the art in economics and psychology on probability assessments at the time:
  - Bayes' rule
  - von Neuman and Morgenstern's (1944) expected utility theory
    - Assumes decision-makers know underlying probabilities
  - Savage's (1954) subjective expected utility
    - Probability assessments can be subjective, ie reasonable people can disagree about likelihood of certain events

Methods in KT74

- The authors report the results of a long list of experiments
  - This is more typical of psychology papers
  - Economics tend to run one experiment with many treatments
- Typical responders
  - College students
  - Often in psychology classes
- Typical sample size: less than 100 students
- Experiments usually delivered in terms of one or more vignettes
- Often followed by non-incentivized reporting of subjective probability assessments

Theories

- Recall our first question: how do people make probability assessments?
- Heuristic is a decision rule: often well-adapted, sometimes maladapted
- KT suggest people make probability assessments is by three heuristics, not by classical probability theory
  1. Representativeness
  2. Availability
  3. Anchoring and adjustment
- We focus on the first two today

Representativeness

- The *representativeness heuristic*: decision-maker determines the probability that A is of class B by the degree that A is representative of B
- For example, the probability that Dick is an engineer is assed at least partly by how representative Dick's personality is of a stereotypical engineer
- That is, vignette "sounds like" an engineer
- This heuristic leads to some very interesting biases (ie systematic mistakes)

Lawyer or Engineer?

Treatment AB:

Suppose I have gathered a sample of 100 professionals, 7030 of whom are lawyers and 3070 of whom are engineers. I have selected one of the 100 people at random; here is a description of this individual:

Dick is a 30 year old man. He is married with no children. A man of high ability and high motivation, he promises to be quite successful in his field. He is well liked by his colleagues. In his spare time, he enjoys restoring classic cars in his garage.

What is the probability that Dick is an engineer?

What should the ratio of your responses to the two treatments be?

Lawyer or Engineer Results

- Kahneman and Tversky (1973) gave this experiment to 171 students at University of Oregon
- Ratio of probabilities was close to 1
  - Subjects are ignoring the *base rate* and instead answering depending on how representative vignette is of lawyer or egineer
- But when no vignette is given, participants report .7 or .3 correctly

Linda the Bank Teller

- *Linda is thirty-one years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.*
- Which alternative is more probable?
  (a) Linda is a bank teller.
  (b) Linda is a bank teller and is active in the feminist movement.

Availability

- The *availability heuristic*: Frequency or probability of event is assessed by how readily examples of this event come to mind.
- Example: assess national divorce rate by thinking of people you know who have been divorced
- Does not necessarily have to do with conditional probabilities
- Good heuristic in most cases, since things that occur frequently are often easier to remember
- However, this also generates biases in some cases

Word Search

- Suppose I randomly select a word (of three or more letters) from the dictionary. Which is more likely? (a) The word begins with the letter *r*. (b) The word has the letter *r* as its third letter.
- Turns out that the answer is (b)
- KT report that in an experiment, most people say (a)
  - This is because examples of (a) are more *available*: it is easier to think of words that start with a certain letter than those that have a certain letter as their third letter
  - We say this is a *bias due to effectiveness of the search set*

Summary

	Representativeness	Availability
Short def'n	"sounds like"	"examples of"
Probabilty	conditional	unconditional
Examples	lawyer vs engineer, Linda	word search

Discussion

- What do you think about the methods employed in the papers summarized by KT?
- Do you think the heuristics can be made more mathematically precise?

Hot Hand Fallacy and Gambler's Fallacy

Motivation

- A fair coin is flipped 10 times, and each time it has come up heads. Which of the following is correct?
  1. The next flip is *more* likely to be heads than tails. That is, the coin flipper is "on a run".
  2. The next flip is *less* likely to be heads than tails. That is, the flipper is "due for tails".
  3. The next flip is *equally* likely to be heads or tails.

Definition

The *hot hand fallacy* is the belief that once an event has occurred several times in a row, it is more likely to occur again, even though the events are independent.

Definition

The *gambler's fallacy* is the belief that once an event has occurred several times isn a row, it is less likely to occur again, even though the events are independent.

Evidence: Gilovich, Vallone, and Tversky (1985)

- Data: shots during home games of the Philadelphia 76ers (basketball team) during one season
- Look at accuracy of next shot after streaks of misses or makes
- What pattern would we expect if we believed in hot hand?

Gilovich, Vallone, and Tversky results

- Results:

Streak	next shot make percentage
3 misses	56%
2 misses	53%
1 miss	54%
1 make	51%
2 makes	50%
3 makes	46%

- Does evidence support existence of hot hand?
- Any concerns about this research design?

Source: Gilovich, Vallone, and Tversky (1985)

Evidence: Terrell (1994)

- Data: betting on daily drawings for New Jersey's parimutuel lottery
  - Choose a number between 000 and 999
  - Winning number is drawn uniformly random
  - If multiple people pick same number, lottery prize divided evenly
- What behavior would we see if bettors believe the gambler's fallacy?

Terrell Results

- Results

Winning number repeated	Average payout per person
within last week	\$349.06
1 to 2 weeks ago	\$349.44
2 to 3 weeks ago	\$307.76
3 to 8 weeks ago	\$301.03
not within last 8 weeks	\$260.11
all winners	\$262.79

- Is evidence consistent with people having gambler's fallacy?

Source: Terrell (1994)

Where do These Fallacies Come From?

- Both fallacies can be explained by one heuristic
- Which one is it?
- Consider how both fallacies view coin flips *HHH*
- Hot hand:
- Gamblers:

Details on Lawyer-Engineer Vignette Calculations

- Let E stand for event that the randomly selected vignette is engineer
- Suppose we are told there are 70 engineers, then Bayes' Rule says

$$P_{70}(E|V) = \frac{P(V|E)P(E)}{P(V)} = \frac{P(V|E)0.7}{P(V)}$$

- If instead we are told there are 30 engineers, then Bayes' Rule says

$$P_{30}(E|V) = \frac{P(V|E)0.3}{P(V)}$$

- Note than in both formulas $P(V)$ (the probability of getting this vignette when drawing randomly) is the same
- Additionally, $P(V|E)$ (the probability of getting this vignette from an engineer) is also the same
- Thus we can take the ratio of the two conditionals:

$$\frac{P_{70}(E|V)}{P_{30}(E|V)} = \frac{0.7}{0.3} = 2.333$$

back