SSP100 Class Notes
How People Really Reason, and Why People Lose Money

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Spring, 2001

Wason Selection Task The four card problem you looked at in your assignment was developed by the psychologist Peter Wason [1] (c.f. Baron).

You gave subjects the following instructions: "These cards were supposed to have been made according to the rule that 'if a card has a vowel on one side, then it has an even number on the other side.' So, which card(s) do I need to turn over in order to determine if the rule has been adhered to?"

Commonly subjects choose to turn over cards with vowels and cards with even numbers, but this is not correct! (Consider your intuitions when asked to judge "All crows are black".)

The results obtained in the assignment for this problem were that from 390 subjects, only 63 chose the right cards, i.e. 16%.

The evidence seems to suggest that people (initially) choose on the basis of possible relevance, not on the basis of logical reasoning.

Performance changes when the problem is worded differently, or when the *domain* is changed. The under-age drinking problem (!) has logically identical structure to the 4 cards problem, but people score much better. The results obtained in the assignment for this problem were that from 390 subjects,189 got the correct answer, i.e. 48%. Part of the remaining error may relate to variations in the experimental conditions.

It has been argued that people's success on the under-age drinking problem relates to an evolutionarily important ability to detect cheaters[2]

The Full Monty I offer someone who has never seen Monty Hall at work the following bets:

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[1] Wason, 1968, "Reasoning about a rule", Quarterly Journal of Experimental Psychology"

[2] Cosmides, L. (1985). Deduction or Darwinian algorithms? An explanation of the "elusive" content effect on the Wason selection task. Doctoral dissertation, Department of Psychology, Harvard University.

1. (Immediately prior to Monty first opening a door) There's a one in three chance of the contestant being right. I'll give you \$10 if her first choice is wrong, and you give me \$20 if her first choice is right. Plus, I'll give you \$1 to accept the bet!
2. (Immediately after Monty opens the first door) There's a fifty-fifty chance for each door. I'll give you \$15 if sticking to the original choice would get the right answer, and you give me \$15 if switching doors would get the right answer. Plus, I'll give you \$1 to accept the bet!

Seems reasonable, but it isn't: this is what's known as a *Dutch Book*.

Probability and Gambling

1. The probability of a tautology is 1.
2. If it's impossible that both A and B, then the probability of at least one is the sum of their individual probabilities.
3. The probability of A and B is the product of the probability of A and that of A given that B.

Given that probabilities are positive real numbers, a way of assigning probabilities to events is *coherent* if and only if (iff) all these postulates hold.

A *fair bet* relative to some assignment of probabilities has the same expected outcome for each player... in the long run such bets would be believed to produce no significant loss to either party.

A *Dutch Book* is a set of bets which combine to force a win for one party regardless of the outcome of the events on which they are betting.

The Dutch Book Theorem If your probability assignments are incoherent, and you accept any bets you judge to be fair or in your favor, I can force money out of you using a Dutch Book. If your assignments are coherent, I can't!

The Inclusion Fallacy

The Conjunction Fallacy

The Representiveness Principle People tend to judge the likelihood of an object being in a category according to how many of the object's salient properties are predicted by membership of the category.(Tversky and Kahneman)

Other Heuristics Avoid Potential Loss, Avoid Conflict!