PHPE 400
Individual and Group Decision Making

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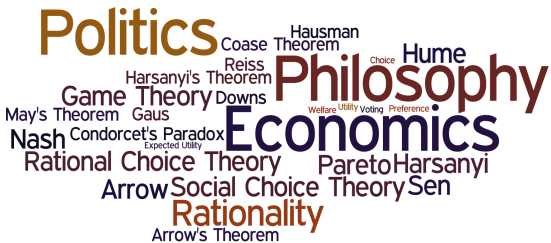
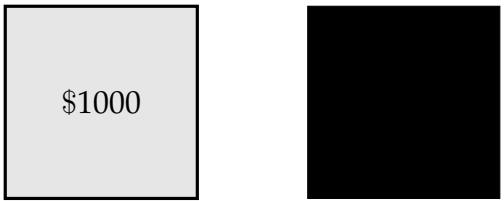


Newcomb's Problem



Choice:

one-box: choose box B

two-box: choose box A and B

A famous example: Newcomb's paradox

A very powerful being, who has been invariably accurate in his predictions about our behavior in the past, has already acted in the following way:

1. If he has predicted we will open just box B, he has put \$1,000,000 in box B.
2. If he has predicted we open both boxes, he has put nothing in box B.

What should we do?

Newcomb's Paradox

you	*pred_B*	*pred_AB*
B	1*M*	0
AB	1*M*+1*T*	1*T*

Newcomb's Paradox

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Principle of dominance: take both boxes.

Newcomb's Paradox

- $P(pred\_B \mid B)$: The probability that the wizard predicted you would choose box B *given that you decided to choose box* B.
- $P(pred\_AB \mid B)$: The probability that the wizard predicted you would choose both boxes *given that you decided to choose box* B.

Newcomb's Paradox

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Expected utility maximization: take box B.

$P(pred\_B \mid B)1M + P(pred\_AB \mid B)0 > P(pred\_B \mid AB)(1M + 1T) + P(pred\_AB \mid AB)1T$

Newcomb's Paradox

What the Predictor did yesterday is *probabilistically dependent* on the choice today, but *causally independent* of today's choice.

Act-state independence: For all states s and actions X, $P(s) = P(s \mid X)$

J. Collins. *Newcomb's Problem*. International Encyclopedia of Social and Behavorial Sciences, 1999.

Game Theory

The Guessing Game

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

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The closest to 2/3 of the average wins.

The Guessing Game (Round 2)

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

The Guessing Game

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

The Guessing Game

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

What number should you guess?

The Guessing Game

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

What number should you guess? 100

The Guessing Game

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

What number should you guess? ~~100~~, 99

The Guessing Game

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

What number should you guess? ~~100~~, ~~99~~, . . . , 67

The Guessing Game

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

What number should you guess? ~~100~~, ~~99~~, . . . , ~~67~~, . . . , 2, 1

The Guessing Game

Guess a number between 1 & 100.
The closest to 2/3 of the average wins.

What number should you guess? ~~100~~, ~~99~~, . . . , ~~67~~, . . . , ~~2~~, (1)