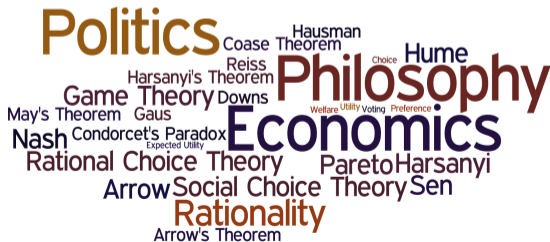# PHPE 400
Individual and Group Decision Making

Eric Pacuit
University of Maryland
pacuit.org
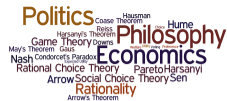
Game Theory

The Guessing Game

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

The Guessing Game

Politics Coase Theorem Hausman Hume Philosophy
Harsanyi's Theorem Rollo
Game Theory Downs
May's Theorem Gaus
Nash Condorcet's Paradox Economics
Rational Choice Theory Pareto Harsanyi
Arrow Social Choice Theory Sen
Rationality
Arrow's Theorem

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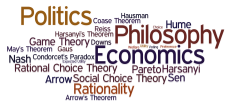The closest to 2/3 of the average wins.

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

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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

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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

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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

Politics Coase Theorem
Hausman
Harsanyi's Theorem Hume
Rolls
May's Theorem Gauss
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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

Traveler's Dilemma

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1. You and your friend write down an integer between 2 and 100 (without discussing).

2. If both of you write down the same number, then both will receive that amount in dollars from the airline in compensation.

3. If the numbers are different, then the airline assumes that the smaller number is the actual price of the luggage.

4. The person that wrote the smaller number will receive that amount plus $2 (as a reward), and the person that wrote the larger number will receive the smaller number minus $2 (as a punishment).
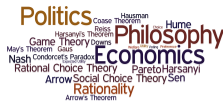
Suppose that you are randomly paired with another person from class. What number would you write down?

From Decisions to Games

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What makes the previous decision problems different from standard decision problems?

From Decisions to Games

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Theorem Rolfs Hume
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What makes the previous decision problems different from standard decision problems?

"*[T]he* fundamental insight of game theory [is] that a rational player must take into account that the players reason about each other in deciding how to play."

R. Aumann and J. Dreze. *Rational Expectations in Games*. American Economic Review, 98, pp. 72-86, 2008.
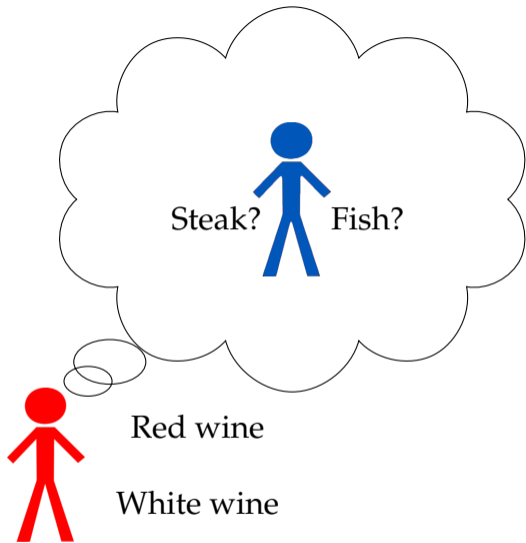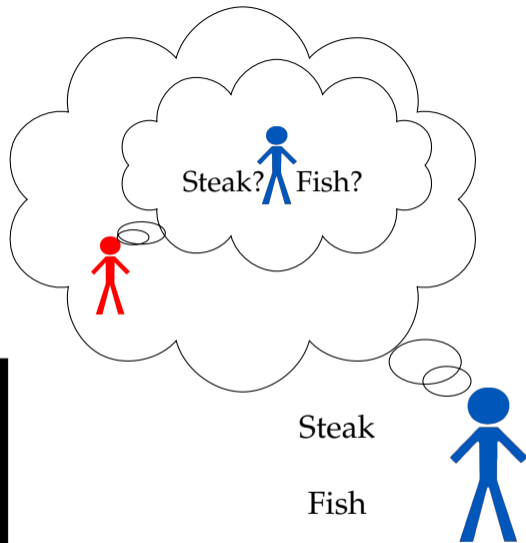
Red wine

White wine
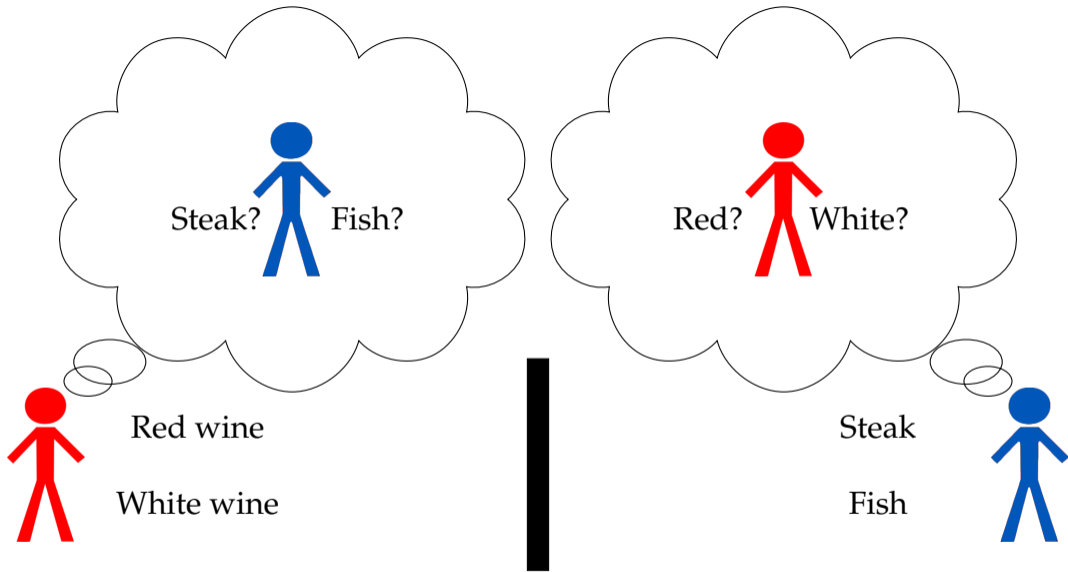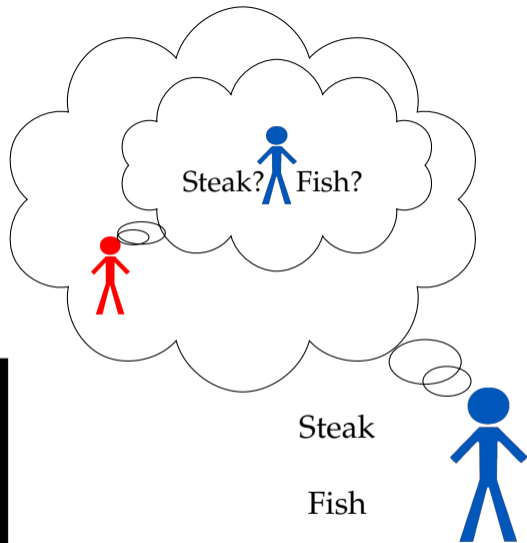
Steak

Fish

Steak? Fish?

Red wine

White wine

Steak? Fish?

Steak

Fish

Red wine

White wine
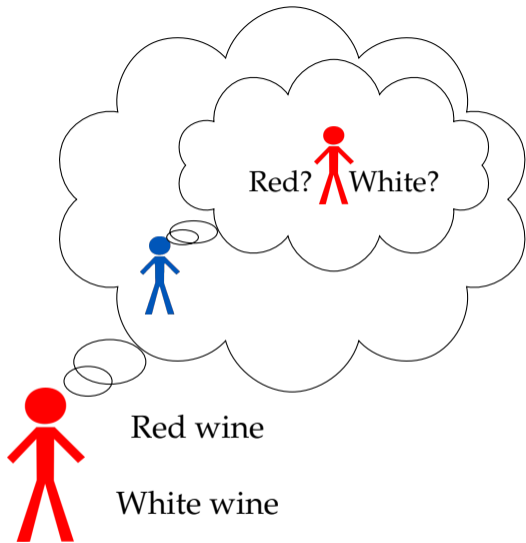
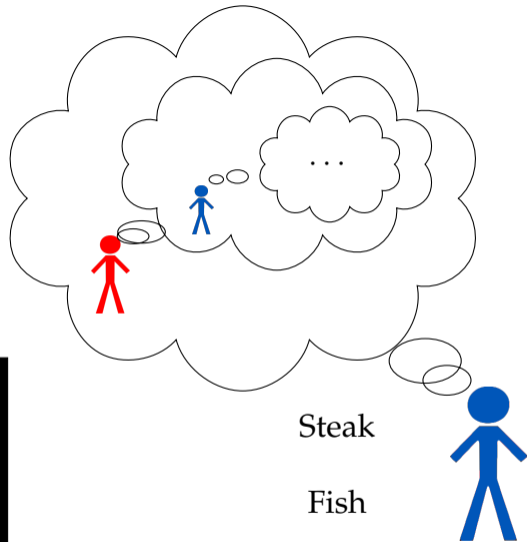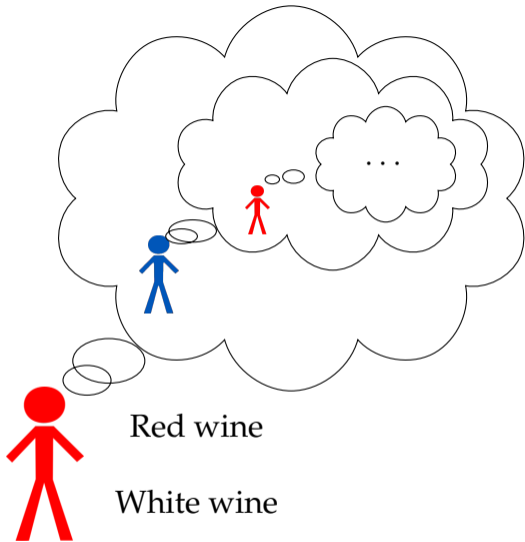Red? White?

Steak? Fish?

Steak

Fish

Red wine

White wine

Steak

Fish

Just Enough Game Theory

A **game** is a mathematical model of a strategic interaction that includes

Just Enough Game Theory

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A **game** is a mathematical model of a strategic interaction that includes

▶ the group of players in the game

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A **game** is a mathematical model of a strategic interaction that includes

- ▶ the group of players in the game
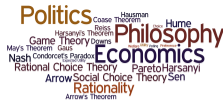- ▶ the actions the players *can* take

Just Enough Game Theory

A **game** is a mathematical model of a strategic interaction that includes

- ▶ the group of players in the game
- ▶ the actions the players *can* take
- ▶ the players' interests (i.e., preferences/utilities),

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- ▶ the actions the players *can* take
- ▶ the players' interests (i.e., preferences/utilities),
- ▶ the "structure" of the decision problem

Just Enough Game Theory

A **game** is a mathematical model of a strategic interaction that includes

- ► the group of players in the game
- ► the actions the players *can* take
- ► the players' interests (i.e., preferences/utilities),
- ► the "structure" of the decision problem (what information do the players have?, what order do they act in?, how many times do they repeat their interaction?, etc.)

Just Enough Game Theory

A **game** is a mathematical model of a strategic interaction that includes

- ▶ the group of players in the game
- ▶ the actions the players *can* take
- ▶ the players' interests (i.e., preferences/utilities),
- ▶ the "structure" of the decision problem (what information do the players have?, what order do they act in?, how many times do they repeat their interaction?, etc.)

*It does **not** specify the actions that the players **do take**.*