PHPE 400
Individual and Group Decision Making

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University of Maryland
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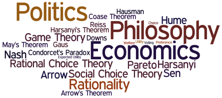
First Steps

1. Make sure you are signed up and can login to Piazza (available on the course website)

2. Sign up for Tophat with join code 209898 (available on the course website)

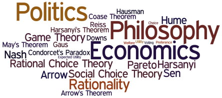
3. Read the course policies (`https://phpe400.info/policies`) and syllabus (`https://umd.instructure.com/courses/1390147/assignments/syllabus`).

Grading



Participation	30%
Problem Sets	40%
Midterm	15%
Final Exam	15%

Online Tools



Course Website

https://umd.instructure.com/courses/1390147

Online Discussion

https://umd.instructure.com/courses/1390147/external_tools/42711

Participation Questions

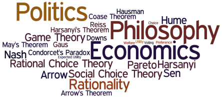
https://umd.instructure.com/courses/1390147/external_tools/81891

Readings and Course Notes

https://umd.instructure.com/courses/1390147/modules

https://notes.phpe400.info

Practicalities: Math



The course is completely self-contained, but it does require that you become comfortable with some mathematical notation.

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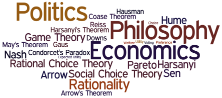
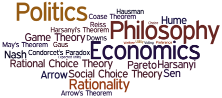


The course is completely self-contained, but it does require that you become comfortable with some mathematical notation.

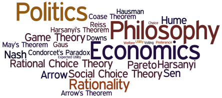
- For example, sets $X = \{a, b, c\}$, subset of $X \subseteq Y$, element of $x \in X$, cross-product $X \times Y = \{(x, y) \mid x \in X, y \in Y\}$, relations $R \subseteq X \times X$, functions $f : X \to Y$, ...

Practicalities: Math



- Ask questions, especially about notation that you do not understand (no matter how trivial).
- The participation questions are designed, in part, to make sure you understand the mathematical notation.
- It is important to use the proper notation on the problem sets and the exams (otherwise we won't understand your answers).
- Attend the discussion sections.

Practicalities: Math



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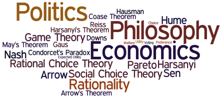
Practicalities: Math

> Economic models consist of clearly stated assumptions and behavioral mechanisms. As such, they lend themselves to the language of mathematics. Flip the pages of any academic journal in economics and you will encounter a nearly endless stream of equations and Greek symbols...**The reason economists use mathematics is typically misunderstood. It has little to do with sophistication, complexity, or a claim to higher truth. Math essentially plays two roles in economics, neither of which is cause for glory: clarity and consistency.**
>
> (Rodrik, pp. 22-23)

D. Rodrik (2015). *Economic Rules: The Rights and Wrongs of the Dismal Science*. W. W. Norton.

What is this course about?



1. What principles determine whether individual and group decisions are **rational**?

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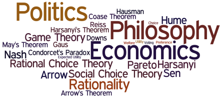
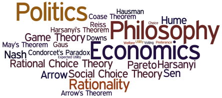


1. What principles determine whether individual and group decisions are **rational**?

2. What assumptions are built into models of decision-making used throughout philosophy and the social sciences, and how should we evaluate these assumptions?

(Useful?) Assumptions



In truth, simple models of the type that economists construct are absolutely essential to understanding the workings of society. Their simplicity, formalism, and neglect of many facets of the real world are precisely what makes them valuable. These are a feature, not a bug.

(p. 11, Rodrik)

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(Useful?) Assumptions

In truth, simple models of the type that economists construct are absolutely essential to understanding the workings of society. Their simplicity, formalism, and neglect of many facets of the real world are precisely what makes them valuable. These are a feature, not a bug.

What makes a model useful is that it captures an aspect of reality. What makes it indispensable, when used well, is that **it captures the most relevant aspect of reality in a given context**. (p. 11, Rodrik)

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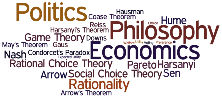
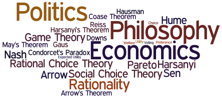
Topics


Politics
Coase Theorem
Hausman
Hume
Reiss
Harsanyi's Theorem
Philosophy
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

Topics



Decision Theory: How should individuals make decisions under uncertainty?

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Game Theory: How should individuals strategize in interactive situations?

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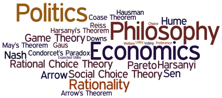
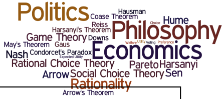


Decision Theory: How should individuals make decisions under uncertainty?

Game Theory: How should individuals strategize in interactive situations?

Social Choice Theory: How should a group aggregate individual opinions to reach a collective decision?



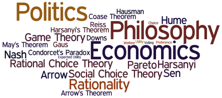
Tentative Schedule

Date	Topic
9/3	Introduction, Rational preferences
9/8 9/10	Rational Preferences
9/15 9/17	Expected utility theory
9/22 9/24	Expected utility theory Evaluating rational choice axioms
9/29 10/1	Evaluating rational choice axioms Decision theory
10/6 10/8	Decision theory Introduction to game theory
10/13 10/15	**No Class: Fall Break** Introduction to game theory
10/20 10/22	Introduction to game theory Midterm Exam

Date	Topic
10/27 10/29	Voting
11/3 11/5	Voting
11/10 11/12	Topics in social choice theory
11/17 11/19	Topics in social choice theory
11/24 **11/26**	Topics in social choice theory **No Class: Thanksgiving Break**
12/1 12/3	Aggregating utilities
12/8 12/10	Aggregating utilities
12/19	Final Exam

Rational Preferences

Simple Choice Model

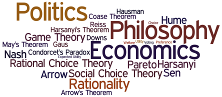


Menu

Simple Choice Model

Choice

Simple Choice Model

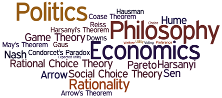


Rational Choice?

Simple Choice Model

> The concept of "preference" is central to economic theory. Economists typically take preferences to be predetermined or "given" facts about individuals and, for their purposes, not in need of explanation or subject to substantive appraisal. Economic analyses begin with an individual's preferences, whatever that may be.
>
> (p. 56, Hausman, McPherson and Satz)

Simple Choice Model



Rational Choice?



Preference

 P  P 

Simple Choice Model

Rational Choice



Preference

 P  P 

Simple Choice Model

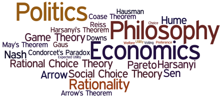
Irrational Choice

Preference

 P  P 

Preferences *and* Beliefs



- **Option uncertainty**: What type of wine is it? Is the red wine sweet or dry? Is the white wine spoiled? Is the lemonade very sugary? . . .

Preferences *and* Beliefs

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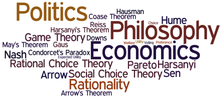
- **Context**: What are we having to eat? What time of day is it? How many drinks have you had? Are you driving home? Are there other drink choices that are available (e.g., a beer or a soda)?. . .

Preferences



Preferring or choosing x is different that "liking" x or "having a taste for x": one can prefer x to y but *dislike* both options

Preferences are always understood as *comparative*: "preference" is more like "bigger" than "big"

Concepts of *preference*

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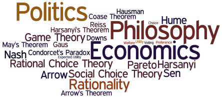

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Rational choice

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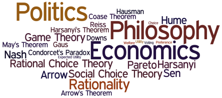
Rational choice



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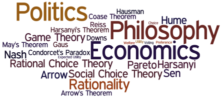
Mathematical background: Relations



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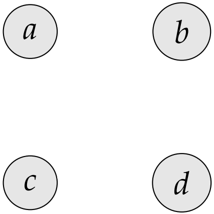
A **relation** on X is a set of **ordered pairs** from X.

That is, if R is a relation on X, then $R \subseteq X \times X$.

Mathematical background: Relations

Example: $X = \{a, b, c, d\}$, $R = \{(a,a), (b,a), (c,d), (a,c), (d,d)\}$



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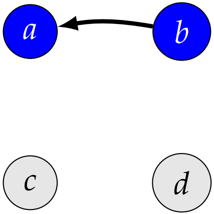

$b \; R \; a$

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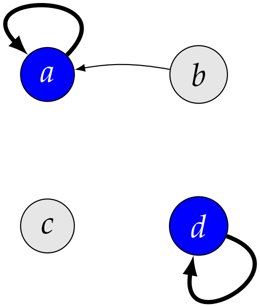

$a \; R \; a$

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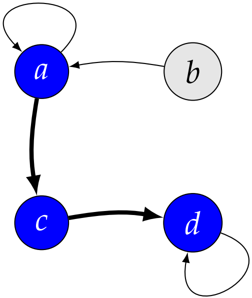
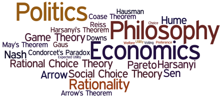


$a \; R \; a$
$b \; R \; a$
$c \; R \; d$
$a \; R \; c$
$d \; R \; d$

Strict Preference



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If P represents the decision maker's strict preference and $x \; P \; y$ (i.e., the decision maker strictly prefers x to y), then the decision maker would pay some non-zero amount money to trade y for x.

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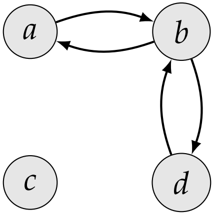
Can *any* relation on X represent a strict preference for a decision maker?

Symmetric/Asymmetric Relations

Suppose that X is a set and $R \subseteq X \times X$ is a relation.

Symmetric relation: for all $x, y \in X$, if $x \mathrel{R} y$, then $y \mathrel{R} x$

Asymmetric relation: for all $x, y \in X$, if $x \mathrel{R} y$, then not-$y \mathrel{R} x$



symmetric but not asymmetric

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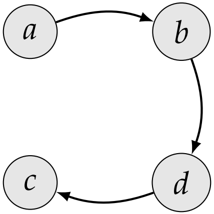

asymmetric but not symmetric

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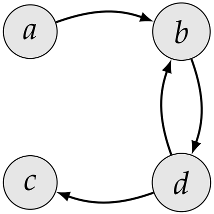

not symmetric and not asymmetric

Strict Preference

A decision maker's strict preference over a set X is represented as a relation $P \subseteq X \times X$.

The underlying idea is that if P represents the decision maker's strict preference and $x\ P\ y$ (i.e., the decision maker strictly prefers x to y), then the decision maker would pay some non-zero amount money to trade y for x.

Assumption: P is asymmetric (for all $x, y \in X$, if $x\ P\ y$, then it is not the case that $y\ P\ x$, written not-$y\ P\ x$).

Indifference/Incommensurable

Suppose that P is an asymmetric relation on X (interpreted as a decision maker's strict preference). Suppose that $x, y \in X$ with not-$x \; P \; y$ and not-$y \; P \; x$.

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There are two reasons why this might hold:

1. The decision maker is *indifferent* between x and y.
   In this case, we write $x \ I \ y$.
2. The decision maker *cannot compare* x and y.
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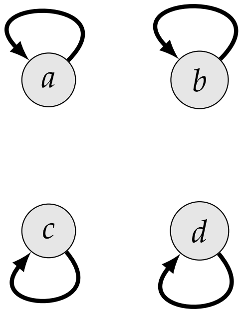
What properties should I and N satisfy?

Reflexive Relations

Suppose that X is a set and $R \subseteq X \times X$ is a relation.

Reflexive relation: for all $x \in X$, $x \; R \; x$



Representing Preferences

Let X be a set of outcomes. A decision maker's *preference* over X is represented by *relations* on X:

- $P \subseteq X \times X$ where $a\ P\ b$ means that the decision maker *strictly prefers* a to b.

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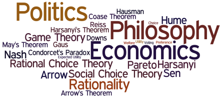

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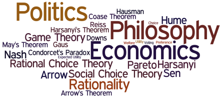

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- $N \subseteq X \times X$ where $a\ N\ b$ means that the decision maker *cannot compare* a and b.

Preferences - Minimal Constraints

A decision maker's preferences on X is represented by three relations $P \subseteq X \times X$, $I \subseteq X \times X$ and $N \subseteq X \times X$ satisfying the following minimal constraints:

1. For all $x, y \in X$, exactly one of $x\ P\ y$, $y\ P\ x$, $x\ I\ y$ and $x\ N\ y$ is true.
2. P is asymmetric
3. I is reflexive and symmetric.
4. N is symmetric.