Introduction to Empirical Methods

Lecture 5: A Brief Introduction to Game Theory

Building Blocks of Formal Models

- Actors: about whose behavior do we care?
- Actions: what can our actors do?
- Outcomes: what are the results of actions?
- Systems: what's the context in which our actors act?

Preferences and Rational Choice

- Preferences: what outcomes do actors want?
- Rational Choice
  - Complete and Transitive Preferences.
  - Choose actions to produce most preferred outcome given constraints.
- Utility
- Expected Utility

Nash Equilibrium and Simultaneous Games

- Simultaneous-move games deal in counterfactuals: what could I get if you were to do that?
- Best Response: rational response to others' actions.
- Nash Equilibrium: All players are playing best responses.
  - Or, no one has a beneficial deviation from equilibrium play.
- Example Games: PD, Coordination/BoS, Chicken, Stag Hunt, Cournot competition.

Subgame Perfection and Sequential Games

- Game Trees, Histories, and Subgames.
- Backward Induction and Subgame Perfection.
- Sequential-move games require specifying what you do in every History.
- Example Games: Ultimatum, Agenda setting, Party competition, Stackelberg competition.

Uncertainty and Mixed Strategies

- Randomizing over strategies generates uncertainty for opponent.
- Often used when no equilibrium in pure strategies exists.
- Goal: make the *other* player indifferent.
- Example Games: Matching pennies/penalty kicks, BoS.

Discounting and Repeated Games

- Discount Factors.
- Present Value.
- Folk Theorems.
- Example Games: Repeated PD, Bargaining.

Behavioral Game Theory

- Incorporates insights from psychology.
- Alternative utility constructions.
- E.g., altruism and inequality averse preferences.
- Example Games: PD, Ultimatum.

Incomplete Information and Bayesian Nash Equilibrium

- Uncertainty over opponents.
- Translate to Prior Beliefs over Player Types.
- Need Equilibrium for every type you might be.
- Example Game: Modified PD.

Bounded Rationality

- Violations of Rationality assumptions.
- Heuristics and Biases.
- Simon's Scissors: Cognitive Constraints and Task Environment.
- Example Games: Centipede, Guessing game.

Games and Experiments

- Derive theory and hypotheses (comparative statics).
- Design simple, short experiment.
- Be sure experiment is *controlled*.
  - Don't want other factors outside of experiment to affect actors' choices within experiment.
  - Try to vary only one parameter at a time.
- Random assignment of subjects.
- State instructions clearly.