

Economics 200B Part 2: Basic Game Theory – Complete Information

Winter 2015, Professor Joel Watson

This is the first part of the core-sequence section on game theory and information economics. Game theory is a technical framework for rigorously analyzing decision-making in settings of interdependence, where the agents care about each other's behavior. Almost every type of interaction between living things is strategic. The material covered in this first part includes representations of games and the basic tools for the analysis of static and dynamic games. Some applications will also be presented, including bargaining if time allows. Repeated games, mechanism design, and standard applications in information economics are covered in Econ 200C.

Schedule: Tuesdays and Thursdays from 11:00 to 12:50 p.m. in Econ 300. There will also problem-solving/discussion sessions led by the teaching assistant, John Rehbeck (jrehbeck@ucsd.edu, SH 207). This session will likely take place on Mondays from 1:00 to 3:00 p.m.

Problem Sets and Examination: Some exercises will be assigned. You must complete the exercises to learn the material. You are encouraged to work on exercises both alone and in study groups. The date of the final examination has yet to be determined.

Watson's Office Hours: These will be determined later. **Please do not disturb Watson outside of office hours unless you have an appointment.**

Textbooks: You are encouraged to consult whatever books match your learning style. Here are some popular texts, in alphabetical order:

Binmore, *Fun and Games*
Fudenberg and Tirole, *Game Theory*
Gibbons, *Game Theory for Applied Economists*
Kreps, *A Course in Microeconomic Theory*
Mas-Colell, Whinston, and Green, *Microeconomic Theory*
McMillan, *Games, Strategies, and Managers*
Osborne and Rubinstein, *Game Theory*
Varian, *Microeconomic Analysis*
Watson, *Strategy: An Introduction to Game Theory*

This is not a comprehensive list. Talk to Watson for more suggestions. You are probably familiar with Kreps, Mas-Colell-Whinston-Green, and Varian. These cover most of the essential material for the course and should be sufficient for students who wish to merely complete the course and pass the micro qualifying exam. If you used only one of these texts as a primary reference for 200A and 200B1, then it will probably be adequate for your studies in 200B2, although Varian's coverage of game theory is thin. Fudenberg-Tirole, Gibbons, and Osborne-Rubinstein are graduate level game-theory texts. Fudenberg-Tirole is the most comprehensive and difficult. Binmore's book is quirky. Watson's book is primarily for advanced undergraduates and beginning graduate students. It discusses all of the essential concepts, definitions, and results without too many technical details. Students who are struggling to grasp some of the basic ideas might find it useful to read Watson's text first.

How to Study: Try to read the textbook coverage of specific topics prior to attending lectures. You must work diligently on exercises to learn the course material; attending lectures is not nearly enough and would give you, at best, a false sense of understanding. There are many exercises in the textbooks. Watson will provide some solutions and additional exercises.

Topics to be Covered

A. Representing Games

Extensive form and generalization

- notation, strategic players, nature

Strategies

- pure, mixed, behavioral

Normal form

- standard versions with and without nature, Bayesian normal form

Knowledge and beliefs (brief overview)

- ways of accounting for knowledge and probabilities, belief hierarchies, states and types, common knowledge, issues with updating after zero-probability events

B. Analysis of Static Settings (Normal Form-Based Concepts)

Core rationality concepts

- beliefs and best response, dominance, relation

Aside: strictly competitive games and security strategies

Iterated dominance, rationalizability

Applications using rationalizability

Nash equilibrium, applications

Existence (rationalizability, equilibrium)

Examples with nature

Correlated equilibrium, notes about payoff-relevance and types

C. Analysis of Dynamic Settings

Core sequential rationality concepts

- conjecture systems and sequential best response, conditional dominance

Iterated conditional dominance, extensive-form rationalizability

Applications, forward induction

Perfect Bayesian equilibrium concepts

Backward induction, subgame-perfect equilibrium

Examples and applications

[If time allows: bargaining, contract]

Mathematical Prerequisites

1. Basic analysis (sequences, etc.) from Econ 205
2. Compactness, convex sets, hyperplanes, separating hyperplane theorem
3. Upper hemi-continuity, closed graph, correspondences, Kakutani's theorem

Additional Mathematics Topics

1. Theorem of the maximum
2. Supermodularity