Economics 286: Game Theory

Stanford University, Spring 2014

Tue, Thu 1:15 – 3:05 PM, Landau 139

Syllabus version: February 7, 2014

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1 Overview

What this class is: This is an intermediate-level, mathematically oriented class in game theory, aimed at economics PhD students (but qualified students in other departments are very much welcome to attend). The goals are twofold: to provide technical tools for studying game-theoretic problems that arise in economic models, and to discuss conceptual issues in interpreting the predictions of game theory.

What this class is not:

- **A class just for micro theorists.** This class is meant to provide concepts and analytical tools useful in every area of economics (and beyond).
- **A first course in game theory.** Technically, the mathematical content will be developed in a way that doesn't presume game theory background; but in practice, if you haven't taken a previous game theory class it will be steep going. (The official prerequisite is ECON 203. If you have taken a different game theory class and are unsure if you are prepared, you are encouraged to discuss with me.)
- **An introduction to the research frontiers.** This is intended as a foundational course, although we will run across a few relatively recent papers. ECON 290 or MGTECON 616 are more like "advanced topics" classes.

Textbooks: The main source for this class is the still-classic

- Drew Fudenberg and Jean Tirole, *Game Theory*, MIT Press, 1991.

Other books that will provide helpful reading for specific parts of the class are

- Drew Fudenberg and David Levine, *The Theory of Learning in Games*, MIT Press, 1998.
- Martin J. Osborne and Ariel Rubinstein, *A Course in Game Theory*, MIT Press, 1994.
- Donald M. Topkis, *Supermodularity and Complementarity*, Princeton University Press, 1998.

There are also a couple more recent books that overlap substantially with parts of the class. I haven't made them official materials for the course, and haven't referred directly to them on the reading list, but you might find them useful:

- George J. Mailath and Larry Samuelson, *Repeated Games and Reputations: Long-Run Relationships*, Oxford University Press, 2006.
- Michael Maschler, Eilon Solan, and Shmuel Zamir, *Game Theory*, Cambridge University Press, 2013.

The course will also draw on assorted papers, as listed below.

Other materials: I don't have detailed lecture notes to distribute, although I can make outlines available. If any students are interested in typing up fully fleshed-out notes as a public good, I am happy to help coordinate.

Assignments: There will be two types of assignments.

- **Problem sets.** There will be four of these assigned (tentative due dates 4/15, 4/29, 5/13, 5/27). I will not grade these. However, you should do them carefully! They will help build your intuitions for the concepts in the course, and will also cover some classic results not covered in lecture.

  The class will collaboratively write official solutions for each problem set. Everyone who is enrolled in the class for credit is expected to pitch in. More details will be issued with the first problem set.

- **Final projects.** These do not need to be original research. Instead, you should summarize and critically review several existing papers related to some topic from this course. You can choose either pure theory papers, or papers that do more

applied modeling as long as they draw on some tools from the course. The intent is for you to dive into the literature on a topic you find interesting, and understand the motivating questions, the approaches that existing research has taken, and the challenges and possible limitations. These will be due 6/6. More instructions will emerge later.

2 Schedule of classes

The lectures will aim to adhere to the following schedule, but in practice there will probably be some adjustment.

2.1 First half: Static games

- 4/1: Basics of static games, solution concepts
  - Fudenberg & Tirole, chapters 1, 2, section 8.4
- 4/3: Knowledge and rationality
  - Osborne & Rubinstein, chapter 5
  - Fudenberg & Tirole, sections 14.1–14.2
- 4/8: Incomplete-information games
  - Fudenberg & Tirole, sections 6.1–6.6
  - Eddie Dekel, Drew Fudenberg, and Stephen Morris (2007), "Interim correlated rationalizability," *Theoretical Economics* 2 (1): 15–40
- 4/10: Almost-common knowledge
  - Fudenberg & Tirole, section 14.4
  - Ariel Rubinstein (1989), "The electronic mail game: strategic behavior under 'almost common knowledge,' " *American Economic Review* 79 (3): 385–391
  - Dov Monderer and Dov Samet (1989), "Approximating common knowledge with common beliefs," *Games and Economic Behavior* 1 (2): 170–190
- 4/15: Special classes of games

  - Osborne & Rubinstein, section 2.5
  - Dov Monderer and Lloyd S. Shapley (1996), "Potential games," *Games and Economic Behavior* 14 (1): 124–143

- 4/17, 4/22, 4/24: Supermodular games
  - Fudenberg & Tirole, section 12.3
  - Paul Milgrom and John Roberts (1990), "Rationalizability, learning, and equilibrium in games with strategic complementarities," *Econometrica* 58 (6): 1255–1277
  - Timothy Van Zandt and Xavier Vives (2007), "Monotone equilibria in Bayesian games of strategic complementarities," *Journal of Economic Theory* 134 (1), 339–360
  - Susan Athey, Paul Milgrom and John Roberts (1998), "Robust comparative statics," draft teaching notes, available online from `http://faculty-gsb.stanford.edu/athey/documents/draftmonograph98.pdf`
  - Topkis, chapter 2, sections 3.1–3.3, chapter 4

- 4/29, 5/1: Evolutionary foundations
  - Fudenberg & Levine, sections 1.1–1.6, 2.1–2.4, 5.1–5.5
  - Julia Robinson (1951), "An iterative method of solving a game," *Annals of Mathematics* 54 (2), 296–301
  - Dov Monderer and Lloyd S. Shapley (1996), "Fictitious play property for games with identical interests," *Journal of Economic Theory* 68 (1), 258–265

2.2 Second half: Dynamic games

- 5/6: Basics of dynamic games
  - Fudenberg & Tirole, chapter 3, sections 4.2, 8.1–8.3

- 5/8: Intuitive criterion, forward induction
  - Fudenberg & Tirole, sections 11.2–11.3

  - Elchanan Ben-Porath and Eddie Dekel (1992), "Signaling future actions and the potential for sacrifice," *Journal of Economic Theory* 57 (1), 36–51

- 5/13, 5/15: Repeated games
  - Fudenberg & Tirole, section 5.1

- 5/20: Imperfect monitoring
  - Fudenberg & Tirole, sections 5.5–5.6
  - Drew Fudenberg, David Levine, & Eric Maskin (1994), "The folk theorem with imperfect public information," *Econometrica* 62 (5), 997–1039

- 5/22, 5/27: Reputation
  - Fudenberg & Tirole, sections 9.1–9.2
  - Jean Tirole (1996) "A theory of collective reputations (with applications to the persistence of corruption and to firm quality)," *Review of Economic Studies* 63 (1), 1–22
  - Jeffrey Ely and Juuso Välimäki (2003), "Bad reputation," *Quarterly Journal of Economics* 118 (3), 785–814

- 5/29, 6/3: Bargaining
  - Fudenberg & Tirole, section 4.4, chapter 10
  - Dilip Abreu and Faruk Gul (2000), "Bargaining and reputation," *Econometrica* 68 (1), 85–117