Game theory syllabus

AY 2024-2025

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Office hours: By appointment or right after class.
Schedule: Tue 14:45-16:15 @ EIEF, Wed 9:00-10:30 @ Luiss, Thu 9:00-10:30 @ EIEF

Course overview

This is the third module in the Luiss/EIEF RoME program's micro sequence. We will develop a toolkit to study strategic interactions, motivated by economic applications. In this course you will learn: (i) how many strategic problems can be modelled as noncooperative games and (ii) reasonable ways of 'solving' those games.

Assignments and assessment

- There will be weekly problem sets. You won't need to hand them in, but you will present solutions at the board. This will count towards 15% of the final grade. The exercise class will be on Tuesdays, starting on the second week.
- The remaining 85% of the final grade comes from a 3-hour, closed-book exam. The exam will contain questions in the spirit of the ones in the problem sets: 5 short ones (each weighing 10%) and 2 long ones (each weighing 25%).

Lecture material and readings

- The lecture slides, what is done at the board and the content of the problem sets are self-contained.
- The closest textbook is Osborne and Rubinstein (1994) (OR) except for repeated games (for which I follow Fudenberg and Tirole (1991)(FT)) and weak perfect Bayesian equilibrium (for which I follow Mas-Colell, Whinston, and Green (1995) (MWG)). Other useful graduate textbooks are Maschler, Solan, and Zamir (2013) and Myerson (1997).
- Those of you who have never seen game theory before might find it valuable to look at some advanced undergraduate textbooks such as Tadelis (2013) (T), Osborne (2003)(O) and Gibbons (1992)(G).
- You may want to use one among T and O alongside OR/FT/MWG if you find the graduate textbooks too abstract.

Detailed course outline

1. Strategic-form games. **OR 2.1-2.4, 3.1-3.3, 4.1-4.3. (T 3-6.)**
   (a) Definition, interpretation, pure and mixed strategies.
   (b) Strict and weak dominance.
      i. The notion of an action being strictly (weakly) dominated.
      ii. The notion of an action being strictly (weakly) dominant.
      iii. Strict and weak dominant-strategy equilibrium.
   (c) Best replies, rationalizability and iterated deletion.
      i. The difference between correlated conjectures and mixed strategies.
      ii. Equivalence between being a never best reply and being strictly dominated.
      iii. Equivalence between (correlated) rationalizability and IDSDS.
   (d) Nash and correlated equilibrium.
      i. The mixed extension and existence.
      ii. Canonical devices and a revelation principle for correlated equilibrium.
      iii. Steady-state and self-enforcing contract interpretation.
2. Incomplete information and Bayesian games. **OR 2.6. (T 12, 13.1.)**
   (a) Definition and interpretation.
   (b) Bayesian Nash equilibrium.
3. Extensive-form games with perfect information. **OR 6.1-6.2, 6.4. (T 7-11.)**
   (a) Definition, strategies and the strategic form.
      i. Strategic-form solution concepts and the credibility of threats.
   (b) Backward induction and subgame perfection.
      i. One-deviation property.
   (c) Repeated games. **FT 5.1.1-5.1.2.**
      i. Some basic results for finitely repeated games.
      ii. Cooperation in the infinitely repeated prisoner's dilemma.
      iii. A Nash folk theorem.
      iv. A Nash-threats perfect folk theorem.
4. Extensive-form games with imperfect information. **OR 11.1,11.4-11.5, 12.1. (T 15, 16.1.)**
   (a) Definition, strategies and the strategic form.
   (b) Mixed and behavioural strategies, and perfect recall.
   (c) Weak perfect Bayesian equilibrium. **MWG 9.C.**
   (d) Definition of sequential equilibrium. **MWG 9.C.**

References

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

Gibbons, Robert. 1992. *Game theory for applied economists*. Princeton University Press.

Mas-Colell, Andreu, Michael D Whinston, and Jerry R Green. 1995. *Microeconomic theory*. Oxford University Press.

Maschler, Michael, Eilon Solan, and Shmuel Zamir. 2013. *Game theory*. Cambridge University Press.

Myerson, Roger B. 1997. *Game theory*. Harvard University Press.

Osborne, Martin J. 2003. *An introduction to game theory*. Oxford University Press.

Osborne, Martin J and Ariel Rubinstein. 1994. *A course in game theory*. MIT Press.

Tadelis, Steven. 2013. *Game theory: an introduction*. Princeton University Press.