

Advanced Game Theory

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Course Objectives

The goal of this class is to introduce students to game theory: the formal study of strategic interactions. We will consider some specific situations in which game theory can inform business and managerial decisions. Starting from the analyses of these situations, we will then proceed to derive general principles that can be applied to any context in which anticipating your opponents' move is critical. The ultimate goal is to teach students to be “strategic thinkers”.

Summary of Course Content

During the entire course, we will continuously move between theoretical models and their business and managerial applications. However, during the first part of the course the focus will be mostly on acquiring analytical tools. During the second part of the course, the focus will switch to business and managerial applications. We will discuss contract design, bargaining and negotiation, the role of information in creating markets, auctions and the allocation of scarce resources.

Students should be aware that game theory is a mathematical field. However, this does not mean that there is “a lot of math”. The mathematical tools we will employ are very simple: basic algebra, discounting, some understanding of probabilities and statistics. However, these tools will be used in a rigorous way, in the sense that we will always be very clear about our assumptions and how we derive certain results. This is important because, in real life, the assumptions presented in class will almost never hold true. Thinking rigorously will allow you to adapt the conclusions reached in class to any situation you may encounter.

Required or Recommended Textbook

The course will not use a textbook, but instead rely on lecture notes, readings and exercises. However, if you are looking for a comprehensive reference on game theory, you may want to read one of the following book:

1. Dixit, Avinash and Nalebuff, Barry. Thinking Strategically. W.W. Norton & Company. 1993
2. Watson, Joel. Strategy: An Introduction to Game Theory. W.W. Norton & Company. 2002.

Watson's book is more technically challenging and abstract, but still has good applications. Two other non-technical references are:

1. Brandenburger, Adam and Nalebuff, Barry. Co-opetition. Doubleday. 1997
2. McAfee, Preston. Competitive Solutions. Princeton University Press. 2005

Preparing for each class

Before each class, students are required to read some material and play some online games.

- The mandatory readings are meant to be a non-technical, fun-yet-intellectually-stimulating introduction to the topics that will be discussed in class. They are, as much as possible, taken from recent newspaper articles and blog posts. The goal is to show how the theories presented in class apply to contemporary (or even future!) business challenges and market trends. At the end of each session, we will spend few minutes discussing how the required readings relate to the topics presented in class.
- The online games are mandatory, but your performance in these games does not affect your grade in any way. Students should play those games **without** reading/studying anything, but simply applying their intuition and raw brain power. At the end of each class, I will present the stats relative to how students played the games, and we will discuss how students' choices compare with the theoretical predictions presented in class. The goal is to show how, very often, people play games very differently from what theory predicts, which is relevant if you are trying to anticipate your opponent's moves.

The online games will be made available 1 day before class, and can be played until 1 hour before class. Overall, I expect students to devote between 15 to 20 min per session to readings and pre-class games. Finally, in some sessions there will be an *in-class* game. The structure will be similar: we will play the game before the theory is explained, after that I will explain the theory, and finally we'll see how your performance compares with the theoretical predictions.

Grading

65% of your grade will depend on your performance in 3 problem sets. Each problem set will contain a few exercises, which are applications or extensions (and never repetition) of topics discussed in class. Students should form groups of at most 3, and turn in only one problem set per group. Students will have, more or less, one week to submit each problem set, which should take about 3 to 5 hours to solve. I recommend that each student first try to solve the exercises of the problem set individually, and only later meet with the group and discuss. The remaining 35% of the grade will depend on class participation.

Course outline

Session 1 Intro to the course

- Rationality, knowledge and game theory:
 - playing rationally,
 - playing rationally against a rational opponent,
 - playing rationally against a rational opponent who knows that you are rational,
 - ...

Readings:

- A new solution to the prisoner dilemma: <http://freakonomics.com/2012/04/25/uk-game-show-golden-balls-a-new-solution-to-the-prisoner%E2%80%99s-dilemma/>

Pre-class game: <http://goo.gl/forms/btPDTkQ0S4> (available between 1 day and 1 hour before class)

Session 2 Network externalities

- a.k.a. the chicken-and-egg problem.

Readings:

- <https://hbr.org/2006/10/strategies-for-two-sided-markets>
- <http://avc.com/2015/07/bootstrap-your-network-with-a-high-value-niche-use-case/>

Pre-class game: <http://goo.gl/forms/LWclKHqd0a> (available between 1 day and 1 hour before class)

Session 3 Organizational Structure

- Hold-up problem.
- Organizational structure and vertical integration.

Readings:

- <https://gigaom.com/2010/08/08/open-source-and-economics-how-the-hold-up-problem-explains-the-flash-wars/>
- <http://www.beyondintractability.org/essay/zopa> (review of some negotiation basics that we will use)

Pre-class game: <https://goo.gl/forms/yGUKlejZJqGseGx2> (available between 1 day and 1 hour before class)

Session 4 Games of incomplete information: who is your opponent?

- Market entry with uncertainty about your opponent's costs.
- Bargaining with behavioural types (i.e. pretending to be crazy).

Readings:

- Posturing in negotiations: <http://www.rferl.org/content/persian-letters-nuclear-talks-iran-khamenei-comments/26949541.html>

Pre-class game: <http://goo.gl/forms/ssQU3lg7jg> (available between 1 day and 1 hour before class)

Session 5 Adverse selection and market unravelling

- Lemon problem: there could be a market here!

Readings:

- Technology and asymmetric information: <http://www.cato-unbound.org/2015/04/06/alex-tabarrok-tyler-cowen/end-asymmetric-information>

Pre-class game: <http://goo.gl/forms/yKhIBtawYe> (available between 1 day and 1 hour before class)

Session 6 Screening and Signalling

- Signalling: burning money because I can.
- Design contract to screen buyers

Readings:

- <http://www.economist.com/node/5323772>

Pre-class game: None

Session 7 Auctions

- How to allocate an object when there is one seller and many buyers.

Readings:

- Paul Klemperer (2002) "How (not) to run auctions: The European 3G telecom auctions" *European Economic Review*. (available: <http://www.econ.ucsb.edu/~tedb/Courses/Ec100C/Readings/hownottorunauctionsklemperer.pdf>)

Pre-class game: <http://goo.gl/forms/BxqqUHftbg> (available between 1 day and 1 hour before class)

Session 8 Herding

- Can everybody be wrong?

Readings:

- <http://www.nytimes.com/2007/10/09/science/09tier.html>
- <http://www.nytimes.com/2003/07/29/us/threats-responses-plans-criticisms-pentagon-prepares-futures-market-terror.html>

Pre-class game: <http://goo.gl/forms/IR0yBeK0Uz> (available between 1 day and 1 hour before class)