

Game Theory
XMBA 296 and EWMBA 211
Spring 2024
Course Outline

I. Contact information

Instructor

- Shachar Kariv [kariv@berkeley.edu]

GSI

- Sara Neff [sara_neff@berkeley.edu]

II. General information

The course presents some of the main topics in game theory. Game theory is about what happens when decision makers (spouses, workers, managers, presidents) interact. In the past fifty years, game theory has gradually become a standard language in economics. The power of game theory is its generality and (mathematical) precision, and because game theory is rich and crisp, it is applicable to many business situations. But the spread of game theory outside of economics has suffered because of the misconception that it requires a lot of fancy math.

A typical question is what is game theory good for, or more precisely, is game theory meant to predict what decision makers do, to give them advice, or what?! The answer is that (only) the tools of analytical game theory can be used to predict, postdict (explain), and prescribe, taking into account that even if game theory is not always accurate, descriptive failure is prescriptive opportunity.

As Robert J. Aumann (2005 Nobel Economics Laureate “for having enhanced our understanding of conflict and cooperation through game-theory analysis”) said “... game theory is a sort of umbrella or ‘unified field’ theory for the rational side of social science, where ‘social’ is interpreted broadly, to include human as well as non-human players (computers, animals, plants).” We will show that game theory is not just a normative theory (how people ought to choose), but also as a descriptive theory (how people actually choose) and even as a prescriptive theory (as a practical aid to choice).

III. Reading material

The class will rely on handouts that will be given for each class and also be available for downloading in PDF format from the course web page. The notes will contain all the material for the course. There are also many more excellent game theory textbooks around. The only required textbooks is:

- Steven Tadelis, **Game Theory: An Introduction**. Princeton University Press

These book present the main topics of game theory at a level suitable for our purposes and emphasizes the theory's foundations as well as recent topics in game-theoretic research. It provides precise definitions and proofs of broad range of results. These books are lighter reading on business and game theory:

- Avinash Dixit and Barry Nalebuff, **The Art of Strategy**. WW Norton.
- Adam Branderburger and Barry Nalebuff, **Co-opetition**. Currency Doubleday.

IV. Problem sets

The course will rely heavily on problem sets. Each block a problem set will be assigned and will generally be due the following block. The problem sets are meant to be learning tools and will therefore not counted for the course grade. All questions in the problem sets are a required material. Please work on the problem sets with each other. Full answer keys will be distributed.

V. Grading

The requirement for a grade in the class is a take-home final exam. The final exam will test your basic knowledge in the course material and the ability to apply this material to new problems. Problem sets are not graded. No points are given for class presence and participation. The problem sets and class participation are very important part of the learning process in this course, but our working assumption is that carrots and sticks are not needed to induce active class participation and discussion.

VI. Office hours

Online by appointment. Further details will be given in the first lecture. Feel free to drop by to ask questions, or even just to introduce yourself and to chat. You can e-mail us any question, and we will try to respond promptly. You can also message us using the bCourses system. In case you have any trouble, there are plenty opportunities for help. We would also be happy to discuss with you any issues beyond the course work, not necessarily of game-theoretic substance.

VII. Some additional information

The course covers non-cooperative game theoretic models, which are those in which the set of actions of individual players is the primitive of the analysis (by contrast to cooperative models in which the sets of joint actions of groups of players are primitives). The course is divided to three parts, each consists of about a third: (i) strategic and extensive games with perfect information, (ii) strategic and extensive games with imperfect information, and (iii) optional topics, variations and extensions.

- The dimension on which the division of the course is based is as follows. Under perfect information, players are assumed to be able to observe all the decisions that have previously been made (they have perfect information about the entire history of actions that have been taken before them). Under imperfect information, by contrast, players may observe the actions of *some* other agents in the economy but they do not observe the actions of *all* the other players.
- A strategic game is a model in which each player chooses his plan of action once and for all, and these choices are made simultaneously. An extensive game, by contrast, is a model in which there is a specified an order of events and each player can consider her plan of action whenever it is her turn to make a decision. Repeated games is an interesting class of extensive form games which examine the logic of long term interaction and explain phenomena such as cooperation, threats and punishments.
- The optional topic part of the course will cover other areas of game theory such as auctions, bargaining, and social learning. Bargaining games also use the model of an extensive form game to study negotiations which are situations in which people's interests conflict. Social learning occurs in any situation in which people learn by observing the behavior of others.