Rudolf Kerschbamer and Daniel Neururer

Game Theory

WS 17/18

General Remarks

The course Game Theory consists of a weekly 3-hours lecture (LV-Nr.: 432120 for the Master Program Applied Economics and LV-Nr.: 432123 for the Master Program Banking and Finance) and of a 1-hour proseminar (LV-Nr.: 432121 or 432122 for the Master Program Applied Economics and LV-Nr.: 432124 or 432125 for the Master Program Banking and Finance). The 3-hours lecture has 5 ECTS for the Master Program Applied Economics and 6 ECTS for the Master Program Banking and Finance and is given by Rudolf Kerschbamer, the 1-hour proseminar has 2,5 ECTS ECTS for the Master Program Applied Economics and 4 ECTS for the Master Program Banking and Finance and is given by Daniel Neururer.

Requirements

Basic knowledge of microeconomics as well as the willingness to deal with formal models.

Target Group

First year students in the Master Program Applied Economics and second year students in the Master Program Banking and Finance.

Course Credits within the Curriculum

This course is compulsory for the Master Program Applied Economics and it is elective for the Master Program Banking and Finance.

Time and Place

The lecture will take place weekly on Tuesdays from 12:00-14:45 in UR 3, starting October 3, 2017. The 1-hour proseminar will take place weekly on Thursday – starting October 5, 2017 – either from 16:00-16:45 in SR 4, or from 17:00-17:45 in SR 4.

The preliminary meeting for the whole course is on Tuesday, October 3, 12:00 am in UR 3.

Lecture and Exam Dates:

Di 03.10. 12.00 - 14.45	**UR 3**	**Lectures 0&1**
Di 10.10. 12.00 - 14.45	**UR 3**	**Lecture 2**
Di 17.10. 12.00 - 14.45	**UR 3**	**Lectures 3&4**
Di 24.10. 12.00 - 14.45	**UR 3**	**Lecture 5**
Di 07.11. 12.00 - 14.45	**UR 3**	**1st Exam**
Di 14.11. 12.00 - 14.45	**UR 3**	**Lecture 6**
Di 21.11. 12.00 - 14.45	**UR 3**	**Lecture 7**
Di 28.11. 12.00 - 14.45	**UR 3**	**Lecture 8**
Di 05.12. 12.00 - 14.45	**UR3**	**Lecture 9**
Di 12.12. 12.00 - 14.45	**UR 3**	**2nd Exam**
Di 09.01. 12.00 - 14.45	**UR 3**	**Lectures 10&11**
Di 16.01. 12.00 - 14.45	**UR 3**	**Lecture 12**
Di 23.01. 12.00 - 14.45	**UR 3**	**Lecture 13**
Di 30.01. 12.00 - 14.45	**UR 3**	**3rd Exam**

Proseminar Dates:

Do 05.10.	**SR 4**	**Lecture 1**
Do 12.10.	**SR 4**	**Lecture 2**
Do 19.10.	**SR 4**	**Lectures 3&4**
!!! Di 31.10. !!! 12.00 – 14.45	**UR 3**	**Lecture 5**
Di 07.11. 12.00 - 14.45	**UR 3**	**1st Exam**
Do 16.11.	**SR 4**	**Lecture 6**
Do 23.11.	**SR 4**	**Lecture 7**
Do 30.11.	**SR 4**	**Lecture 8**
Do 07.12.	**SR 4**	**Lecture 9**
Di 12.12. 12.00 - 14.45	**UR 3**	**2nd Exam**
Do 11.01.	**UR 3**	**Lectures 10&11**
Do 18.01.	**UR 3**	**Lecture 12**
Do 25.01.	**UR 3**	**Lecture 13**
Di 30.01. 12.00 - 14.15	**UR 3**	**3rd Exam**

Outline of Contents

Below is an outline of the course that roughly but not precisely corresponds to each class session:

1. **Representation of Games**

   ***Lecture 1 Representation of Games*:** normal-form representation, extensive-form representation, information sets, random moves, histories, pure strategies, relationship between extensive-form and normal-form, mixed strategies and expected utility

2. **Dominance**

   Lecture 2 Static Games of Complete Information - Dominance: (strictly) dominant strategies, (strictly) dominated strategies, iterated deletion of strictly dominated strategies, iterated deletion and rationality, mixed strategies and dominance

3. **Static Games of Complete Information: Nash Equilibrium**

   Lecture 3 Static Games of Complete Information - Pure Strategy Nash Equilibrium in Finite Games: definition of Nash equilibrium (NE), finding NE, best-response correspondences and NE, motivating NE, relation between NE and iterated deletion, existence of NE in pure strategies in finite games, multiplicity

   Lecture 4 Static Games of Complete Information - Mixed Strategy Nash Equilibrium in Finite (Discrete) Games: definition of mixed strategy NE, finding mixed strategy NE, mixed best-response correspondences and mixed NE, motivating mixed NE, existence of (possibly mixed) NE in finite games

   Lecture 5 Static Games of Complete Information - Nash Equilibrium in Infinite (Continuous) Games: finding NE in games with continuous strategy spaces, best-response correspondences and NE with continuous strategy spaces, strategic substitutes vs. strategic complements, applications in economics and finance, existence of NE in games with continuous strategy spaces

4. **Dynamic Games of Complete Information: Subgame Perfect Equilibrium**

   Lecture 6 Dynamic Games of Complete Information - Subgame Perfect Nash Equilibrium in Finite Games: incredible threats and incredible promises, subgames, definition of subgame perfect Nash equilibrium (SPNE), finding SPNEs in games of perfect information (Backward Induction Procedure), finding SPNE in games of imperfect information (Generalized Backward Induction Procedure), NE versus SPNE, existence of SPNE in finite games

   ***Lecture 7 Dynamic Games of Complete Information - Subgame Perfect Nash Equilibrium in Continuous Games with Perfect Information*:** finding SPNE in continuous games of perfect information, SPNE outcome vs. SPNE, games of positive externalities vs. games of negative externalities, NEs of simultaneous-move vs. SPNE of sequential move games, costs and benefits of precommitment: first-mover advantage vs. second-mover advantage, strategic effect and direct effect of first-stage behaviour, applications

***Lecture 8 Dynamic Games of Complete Information - Subgame Perfect Nash Equilibrium in Continuous Games with Imperfect Information*:** finding SPNE in continuous games of imperfect information, strategic precommitments to affect future interactions, formal analysis of incentives for precommitment, strategic effects and direct effects, Tirole's animal terminology to characterize commitment strategies, a graphical analysis of precommitment effects

Lecture 9 Dynamic Games of Complete Information - Subgame Perfect Nash Equilibrium in Games with (Potentially) Infinite Sequences of Moves: finding SGPE in games with (potentially) infinite sequences of moves, motivation for repeated games, finitely and infinitely repeated games, finitely repeated games with unique and with multiple NE in stage-game, one-stage-deviation principle, infinitely repeated games and discounting, applications of infinitely repeated games (cooperation in social dilemmas, collusion), characterizing SPNE outcome paths in payoff space (folk theorems), infinite horizon, infinite action bilateral bargaining

5. Static Games of Incomplete Information: Bayesian Equilibrium

***Lecture 10 Static Games of Incomplete Information - Bayesian Equilibrium in Finite (Discrete) Games*:** incomplete information, Harsanyi transformation, definition of Bayesian equilibrium (BE), finding BE in finite games, correlated types, applications, existence of BE in finite games
BE

Lecture 11 Static Games of Incomplete Information - Bayesian Equilibrium in Infinite (Continuous Action and/or Continuous Type Spaces) Games: definition of BE in games with continuous action and/or continuous type spaces , finding BE in games with continuous action and/or continuous type spaces, Cournot with asymmetric information on cost, purification of mixed strategies, first price auction

6. Dynamic Games of Incomplete Information: Perfect Bayesian Equilibrium

***Lecture 12 Dynamic Games of Incomplete Information - Perfect Bayesian Equilibrium in Finite Games*:** motivation for definition of perfect Bayesian equilibrium (PBE), elements of PBE, definition of PBE, finding PBE, applications

***Lecture 13 Dynamic Games of Incomplete Information - Perfect Bayesian Equilibrium in Signalling Games*:** definition of signalling game, translation of definition of PBE (for general games) to a definition of PBE for signalling games, finding PBE in signalling games, applications of signalling in economics and finance

***Lecture 14 Dynamic Games of Incomplete Information – Refinements of Perfect Bayesian Equilibrium**:* implausible beliefs off-the-equilibrium-path, forward induction, domination-based refinements on beliefs, intuitive criterion, other refinements, applications

Lecture 14 will not be covered in class and it is not relevant for the exams. The slides will be available, though.

References:

Although the slides are pretty much self-contained, it does make sense to take a look at a textbook. Useful references are:

Osborne, M. and A. Rubinstein, *A Course in Game Theory*, MIT Press

Myerson, R., *Game Theory - Analysis of Conflict*, 1st ed., Harvard Univ. Press

Fudenberg, D. and J. Tirole, *Game Theory*, MIT Press

Most of the material is (at a somewhat lower level) also covered in:

Gibbons, R., *A Primer in Game Theory*, Harvester/Wheatsheaf.

Most of the material is (to some extent) also covered in:

Mas-Colell, A., M. Whinston and J. Green, *Microeconomic Theory*, Oxford Univ. Press

Find all basic concepts also in:

Osborne, M., *An Introduction to Game Theory*, Oxford Univ. Press.

Course Requirements

Regular attendance in class: Regular attendance and participation in class is expected. If you cannot attend for any reason, please inform us per e-mail. Please don't provide any reasons, just inform us that you cannot attend.

Problem sets: To help you to gain ease in applying the tools of non-cooperative game theory, there will be weekly problem sets. Please work on the problems in small groups (comprising no more than four students each)

Participation in three written exams: The three exams include material from both parts of the course. You find the exam dates and places on one of the earlier pages

Please note the above dates now, and keep them free from any other obligations. We can offer alternative exam dates only in exceptional circumstances.

Grading Scheme for this Course:

Will be announced in one of the first meetings.

Registration

Registration by computer. **Attendance in the first meeting (October 3) is** nevertheless **required!**