



BUSINESS SCHOOL
Te Kura Pakihi

ECON 319: Game Theory

Second semester 2024

...: COURSE OUTLINE ...:

This outline is prepared for face-to-face teaching conditions. Any necessary adjustments due to COVID-19 will be announced at Blackboard.

For all University of Otago information and updates regarding Coronavirus COVID-19, please refer to the Covid-19 webpage found at: <http://www.otago.ac.nz/coronavirus/index.html>.

1 Description

Game Theory is the study of mathematical models of strategic decision making with interacting decision makers. This theory has become a fundamental tool in the study of social interaction in economics, political science, anthropology, sociology, animal behavior, biology, computer science and other disciplines. In this course we introduce basic concepts and tools of game theory and explore a variety of applications. The course focusses more on concepts and illustrative examples rather than on mathematical theory.

2 Learning outcomes

The aim of this course is to introduce you to the world of game theory and its application in a wide range of disciplines. After completing this course, you will be able to:

- demonstrate an understanding of a variety of game theoretic methods of analysing behaviour in strategic situations;
- apply that understanding to predict behaviour and evaluate business and policy options;
- reflect on game theoretical methods from a multi-disciplinary perspective;
- appreciate the impact that game theory has made, and continues to make, in a variety of contexts.

3 Teaching staff

Name: Daniel Neururer

Email: daniel.neururer@otago.ac.nz

Office: Room 616 (Otago Business School)

Office hours: I have an open-door policy - simply drop in or arrange a specific appointment via mail.

4 Learning resources

The main literature is the textbook

J. Harrington (2015). Games, Strategies and Decision Making, Second Edition.
Palgrave MacMillan.

from which almost 90% will be covered.

5 Course structure

There will be four meetings of 50 minutes every week. The style in which the meetings take place depends on the goals set for the particular meeting. Conceptual knowledge is typically introduced via in-class experiments (on Fridays) and (interactive) lectures (on Tuesdays and Wednesdays), while methodological skills are developed in the tutorials (on Thursdays/Fridays) and via challenging hand-in assignments. Table 1 provides the general structure of the course, with Tables 3–8 at the end of this course manual providing a detailed description for which materials to be prepared (literature and exercises) before each of the meetings.

Weeks	Topic	Chapters
29–30	Introduction to game theory	1–2
31–33	Strategic form games	3–7
34–35	Extensive form games	8–9
37–39	Games of incomplete information	10–12
40–41	Repeated games	13–14
42	Evolutionary game theory	16–17

Table 1: General structure.

6 Roles and responsibilities

Literature. You are encouraged to have had a quick glance at the literature before the lectures. This ensures that you will be able to get most out of the lectures, and know which questions to ask during the lecture.

In-class exercises. These exercises you are expected to make on your own. Results will be discussed during the tutorials. In the tables that follow, some exercises are scheduled at lecture-days. This is to indicate that you would be able to solve those exercises after that lecture.

Hand-in exercises. You are encouraged to discuss hand-in exercises with other students in small groups and to hand in solutions as a group, in which case all individuals in a group receive the same grade. Precise deadlines for handing in, and the precise details on the scoring system, will be communicated in class or via *Blackboard*.

7 Assessment

Only if you obtain a score of at least 40 (out of 100) points in the final examination, your score for the hand-in exercises will work as a plussage towards your final score. In that case, your final score will be based for 40% on the hand-in exercises and for 60% on the final examination (unless your score for the final examination is larger than for the hand-in exercises, in which case your score in the final examination will be your final score). The (rounded) final score is transferred into a final grade in accordance to the Otago grading scheme, presented in Table 2.

Grade	Score	Grade	Score
A+	90–100	C+	60–64
A	85–89	C	55–59
A–	80–84	C–	50–54
B+	75–79	D	40–49
B	70–74	E	00–39
B–	65–69		

Table 2: Grading scheme.

8 Detailed schedule

8.1 Introduction to game theory

In the first week we consider the psychological profile of a player, using concepts as preferences, beliefs, introspection and infinite regress. In the second week we will look at how a game, as studied further in the course, looks like. We will study how games may differ in the timing of the decision making process and in information structures. While we will also look at the concept of common knowledge, which is important towards solving games, we will not be considering solution concepts yet.

Week	Date	Time	Type	Literature	Exercises	
					In-class	Hand-in
29	Tue 16 Jul	10:00–10:50	Lecture	–	–	–
	Wed 17 Jul	10:00–10:50	Lecture	1.1–1.4	–	–
	Thu 18 Jul	12:00–12:50	Tutorial	–	–	–
	Fri 19 Jul	09:00–09:50		–	–	–
	Fri 19 Jul	11:00–11:50	Lecture	2.1–2.4	–	–
30	Tue 23 Jul	10:00–10:50	Lecture	2.5–2.7	2.5, 2.7	–
	Wed 24 Jul	10:00–10:50	Lecture	2.8–2.9	2.8, 2.11	2.6 a., 2.15
	Thu 25 Jul	12:00–12:50	Tutorial	–	–	–
	Fri 26 Jul	09:00–09:50		–	–	–
	Fri 26 Jul	11:00–11:50	Lecture	–	–	–

Table 3: Introduction to game theory.

8.2 Strategic form games

One of the games that you have been introduced to is the strategic form game. During the following three weeks we will study these games in-depth. In the first week we will learn first what rationality means and how this naturally leads to the concepts of dominant and dominated strategy. Using these concepts together with the notion of common knowledge of rationality is a first step to understanding how players (should) play games. Next, still in the first week, we will learn the Nash equilibrium concept. While we address rather simple strategic form games in the first week, we will move to more complicated games in the second week, where we focus on games of coordination, voting situations and oligopolistic markets. In the last week we extend the Nash equilibrium concept allowing players to randomize their actions.

Week	Date	Time	Type	Literature	Exercises	
					In-class	Hand-in
31	Tue 30 Jul	10:00–10:50	Lecture	3.1–3.5	–	–
	Wed 31 Jul	10:00–10:50	Lecture	4.1–4.4	3.3, 3.5, 3.14, 3.18	3.16
	Thu 1 Aug	12:00–12:50	Tutorial	4.5–4.6	4.3, 4.5, 4.9	4.15, 4.18
	Fri 2 Aug	09:00–09:50				
	Fri 2 Aug	11:00–11:50	Lecture	3.7	–	–
32	Tue 6 Aug	10:00–10:50	Lecture	5.1–5.4	–	–
	Wed 7 Aug	10:00–10:50	Lecture	6.1–6.3	5.12, 5.13a, 5.15, 5.20	5.5, 5.19
	Thu 8 Aug	12:00–12:50	Tutorial	–	6.1, 6.3, 6.9, 6.11	6.2
	Fri 9 Aug	09:00–09:50				
	Fri 9 Aug	11:00–11:50	Lecture	6.App, 7.2	–	–
33	Tue 13 Aug	10:00–10:50	Lecture	7.1, 7.3, 3.8, 7.4–7.5	–	–
	Wed 14 Aug	10:00–10:50	Lecture	7.6	7.3, 7.17	7.4
	Thu 15 Aug	12:00–12:50	Tutorial	–	7.5, 7.6, 7.19	7.18
	Fri 16 Aug	09:00–09:50				
	Fri 16 Aug	11:00–11:50	Lecture	–	–	–

Table 4: Strategic form games.

8.3 Extensive form games

One other type of games that you have been introduced to is the extensive form game. During the following two weeks we will study these games in-depth and solve these games using backwards induction reasoning, which leads to the concept a subgame perfect Nash equilibrium. In the first week we will address games with a simple information structure; more complicated structures are addressed in the second week. During these two weeks you will learn about threats and promises, these being credible or not, and strategic commitment.

Week	Date	Time	Type	Literature	Exercises	
					In-class	Hand-in
34	Tue 20 Aug	10:00–10:50	Lecture	8.1–8.3	–	–
	Wed 21 Aug	10:00–10:50	Lecture	8.4–8.5	8.1, 8.15	8.5
	Thu 22 Aug	12:00–12:50	Tutorial	–	8.10, 8.19	8.8, 8.17
	Fri 23 Aug	09:00–09:50				
	Fri 23 Aug	11:00–11:50	Lecture	–	–	–
35	Tue 27 Aug	10:00–10:50	Lecture	9.1–9.3	–	–
	Wed 28 Aug	10:00–10:50	Lecture	9.4–9.5	9.1, 9.5	9.2
	Thu 29 Aug	12:00–12:50	Tutorial	–	9.14, 9.15	9.9, 9.20
	Fri 30 Aug	09:00–09:50				
	Fri 30 Aug	11:00–11:50	Lecture	–	–	–

Table 5: Extensive form games.

8.4 Games of incomplete information

All games until the mid-semester break concerned games where different players are aware of each others' incentives. Now, for the upcoming three weeks, we turn to games where this is not the case. That is, some players may know things (about themselves or about circumstantial properties) that other players may not know. In the first week we learn the solution concept of Bayes-Nash equilibrium, and use these to understand behaviour in auctions and differences between different auction designs. In the second week we consider game situations where one player can signal information to another player, such as trainees about their work attitude towards getting tenured, and learn the concept of perfect Bayes-Nash equilibrium to study those games. We finish this part of the course with cheap-talk games, where incentives to lie and deceive can distort information processes, and learn when communication may (not) be credible in such games.

Week	Date	Time	Type	Literature	Exercises	
					In-class	Hand-in
37	Tue 10 Sep	10:00–10:50	Lecture	10.1–10.3	–	–
	Wed 11 Sep	10:00–10:50	Lecture	10.6, 10.4–10.5	10.1, 10.5	10.14
	Thu 12 Sep	12:00–12:50	Tutorial	–	10.3, 10.17	10.12
	Fri 13 Sep	09:00–09:50	Lecture	[10.7], 11.5	–	–
38	Tue 17 Sep	10:00–10:50	Lecture	11.1–11.2, 11.3(ex.1)	–	–
	Wed 18 Sep	10:00–10:50	Lecture	11.6, 11.3(ex.3), 11.4	11.8, 11.9	
	Thu 19 Sep	12:00–12:50	Tutorial	–	11.1, 11.15	11.6
	Fri 20 Sep	09:00–09:50	Lecture	11.7, [11.3(ex.2,ex.4)]	–	–
39	Tue 24 Sep	10:00–10:50	Lecture	12.1–12.3	–	–
	Wed 25 Sep	10:00–10:50	Lecture	12.4	12.1, 12.3	12.2, 12.5
	Thu 26 Sep	12:00–12:50	Tutorial	–	12.8	
	Fri 27 Sep	09:00–09:50	Lecture	13.6–13.7	–	–

Table 6: Games of incomplete information.

8.5 Repeated games

Where we saw earlier that cooperation is difficult to achieve when games are played only once, for the following two weeks we move on to cooperation when a game is played repeatedly. In the first of these weeks, we consider repeated games played over finite and infinite horizons, and consider different types of strategies that may help players coordinating using strategies that involve punishments (and rewards). In the second week we will consider applications and even more sophisticated punishment strategies.

Week	Date	Time	Type	Literature	Exercises	
					In-class	Hand-in
40	Tue 1 Oct	10:00–10:50	Lecture	13.1–13.2	–	–
	Wed 2 Oct	10:00–10:50	Lecture	13.3–13.5	13.9, 13.14	–
	Thu 3 Oct	12:00–12:50	Tutorial	–	13.10, 13.13	–
	Fri 4 Oct	09:00–09:50		–		
	Fri 4 Oct	11:00–11:50	Lecture	–	–	–
41	Tue 8 Oct	10:00–10:50	Lecture	14.1–14.3	–	–
	Wed 9 Oct	10:00–10:50	Lecture	14.4–14.5	14.3, 14.12	14.4
	Thu 10 Oct	12:00–12:50	Tutorial	–	14.6, 14.10	14.7
	Fri 11 Oct	09:00–09:50		–		
	Fri 11 Oct	11:00–11:50	Lecture	–	–	–

Table 7: Repeated games.

8.6 Evolutionary game theory

We close the course with evolutionary game theory, where we will learn two solution concepts relevant for population dynamics, helping us to understand why different phenotypes of a species may stably co-exist.

Week	Date	Time	Type	Literature	Exercises	
					In-class	Hand-in
42	Tue 15 Oct	10:00–10:50	Lecture	16.1–16.3	–	–
	Wed 16 Oct	10:00–10:50	Lecture	17.1–17.3	16.4, 16.3	–
	Thu 17 Oct	12:00–12:50	Tutorial	–	17.1	–
	Fri 18 Oct	09:00–09:50		–		
	Fri 18 Oct	11:00–11:50	Lecture	–	–	–

Table 8: Evolutionary game theory.

9 Student learning support and information

Student Charter

www.otago.ac.nz/about/otago005275.html

Guidelines for Learning at Otago

www.otago.ac.nz/hedc/index.html

Student Learning Centre

The Student Learning Centre, which is part of the Higher Education Development Centre, provides learning support, free of charge, to ALL enrolled students. Their services include:

- a workshop programme designed to help students to improve their learning strategies and their generic skills; slc.otago.ac.nz/attend-a-workshop/
- free and confidential consultations with a learning adviser for assistance with learning strategies; slc.otago.ac.nz/talk-to-a-learning-adviser/
- on-line study skills advice;
- a student leadership programme
- a student-led peer support programme for students of all ages and backgrounds
- conversational English groups for students from a non-English speaking background.

Library Support

The Library website (www.otago.ac.nz/library) provides access to resources and services, including group room bookings, library hours and locations, past exam papers, subject guides, article databases and more. If you need assistance either check out the self-help guides (otago.libguides.com/selfhelp), or ask Library staff at the ground floor service desks, or email ask.library@otago.ac.nz

Kaiāwhina Māori | Māori student support

Ben is the Kaiāwhina Māori (Māori student support) for Te Kura Pākihi | Otago Business School. He is able to answer any questions you may have about studying here at the University of Otago. He can provide information about scholarships, campus services, pastoral and financial care. Ben is also here to support those students who are studying away from their

whānau, hapū and iwi, to ensure they feel safe and supported. He has a passion for the development of Rangatahi and understands the struggles that can come with academic life.

Tel +64 27 513 6991

Email ben.sommerville@otago.ac.nz

Pacific Student Support Facilitator (part-time)

Malo e lelei

Falaviena Faiva works part-time in the Dean's Office at the Otago Business School, Division of Commerce. Falaviena is of Tongan descent and one of our two Pacific Student Support Facilitators. She is responsible for all second-year Pacific students within the division. Falaviena is a University of Otago, Humanities and Commerce graduate and is currently completing a Postgraduate Commerce degree in International Business.

Deans Office, Otago Business School

Division of Commerce

Email: viena.faiva@otago.ac.nz

Cell Phone: 021 279 0914

Bula Vinaka

Jekope Ramala Maiono also works part time in the Dean's Office at the Otago Business School, Division of Commerce. Maiono is of Fijian descent and our other Pacific Student Support Facilitator. He is responsible for all first-year Pacific students in the division. Maiono is a University of Otago Commerce graduate, also studying a PHD degree in the Division of Humanities.

Deans Office, Otago Business School

Division of Commerce

Email: jekope.maiono@otago.ac.nz

Cell Phone: 021 279 0871

Disability Information and Support

Students are encouraged to seek support if they are having difficulty with their studies due to disability, temporary or permanent impairment, injury or chronic illness. It is important to seek help early, through one of the contacts below:

- The Disabilities Liaison person in the Economics Department is Janet Bryant (Tel: +64 3 479 8656; Email: janet.bryant@otago.ac.nz; Office: OBS 601a)
- Disability Information and Support (Tel: +64 3 479 8235; Email: disabilities@otago.ac.nz; Web: www.otago.ac.nz/disabilities)

International Students

The Otago Business School encourages international students to seek support if they are having difficulties with their studies or meeting other challenges while they are students at the University of Otago. In such instances, international students should feel free to contact International Student Support (Tel: +64 3 479 8344; Email: international.support@otago.ac.nz; Web: www.otago.ac.nz/international; Location: Archway West Building)