Economics and Behaviour

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Content of teaching

The course covers topics from behavioral economics with regard to contents and methods. In addition, the students gain insight into the design of economic experiments. Furthermore, the students will become acquainted with reading and critically evaluating current research papers in the field of behavioral economics.

Prerequisites
None. Recommendations: Basic knowledge of microeconomics and statistics are recommended. A background in game theory is helpful, but not absolutely necessary.

Aim
The students gain insight into fundamental topics in behavioral economics; get to know different research methods in the field of behavioral economics; learn to critically evaluate experimental designs; get introduced to current research papers in behavioral economics; become acquainted with the technical terminology in English.

Bibliography

- Kahnemann, Daniel: Thinking, Fast and Slow. Farrar, Straus and Giroux, 2011.
- Ariely, Dan: Predictably irrational. New York: Harper Collins, 2008.
- Ariely, Dan: The Upside of Irrationality. New York: HarperCollins, 2011.

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1 Gametheorie

Introduction

In analysing game theoretical situations we distinguish between the judging

- **prescriptive** - means containing an indication of approval or disapproval
- **normative** - means relating to our model

or the kind of equilibrium

	complete information	**incomplete information**
static games	Nash-Equilibrium	Bayesian-Nash-Equilibrium
dynamic games	Perfect Nash-Equilibrium	Perfect Bayesian-Nash-Equilibrium

1.1 Games in strategic form

A game in strategic form is completely characterised by $\{N, S, u\}$ where

(1) N is the number of players and for player n would that mean $n \in \{1, \ldots, N\}$.

(2) For each player we have a set of *pure* strategies S.

(3) For each player $n \in \{1, \ldots, N\}$ we have an expected utility function $u : S \to \mathbb{R}$

For two players ($P1$ and $P2$) and two possible signals (a and b) we could use the matrix form, where the $u_i(x, y)$ is the utility function for Player i for signal x for $P1$ and y for $P2$ with $x, y \in \{a, b\}$

$P1$ / $P2$	**a**	**b**
a	$(u_1(a,a), u_2(a,a))$	$(u_1(a,b), u_2(a,b))$
b	$(u_1(b,a), u_2(b,a))$	$(u_1(b,b), u_2(b,b))$

We call a **set of strategies** in a game a complete plan of actions for each situation in the game.

Example 1.1 (Prisoner's Dilemma)
Two members of a criminal gang are arrested and imprisoned. Each prisoner is in solitary confinement with no means of communicating with the other. The prosecutors lack sufficient evidence to convict the pair on the principal charge. They hope to get both sentenced to a year in prison on a lesser charge. Simultaneously, the prosecutors offer each prisoner a bargain. Each prisoner is given the opportunity either to: betray the other by testifying that the other committed the crime, or to cooperate with the other by remaining silent. The offer is:

- If A and B each betray the other, each of them serves 6 years in prison
- If A betrays B but B remains silent, A will be set free and B will serve 9 years in prison (and vice versa)
- If A and B both remain silent, both of them will only serve 1 year in prison (on the lesser charge)

P1 / P2	**defects**	**cooperates**
defects	$(-6,-6)$	$(0,-9)$
cooperates	$(-9,0)$	$(-1,-1)$

Other Interpretations for the Prisoner's Dilemma

- Collusion on prices
- Investing in human capital vs. arming for a war
- Buying a SUV vs. a smaller car

Definition 1.2
A strategy s_i'' is strictly dominated if and only if there exists another strategy s_i' such that

$$u(s_i', s_{-i}) \geq u(s_i'', s_{-i}) \quad \forall s_{-i} \in S_i$$

In the Prisoner's Dilemma *cooperate* is strictly dominated by $defect$. Simply the elimination of strictly dominated strategies leads to the prediction of $(defects, defects)$.

Example 1.3
Iterated elimination of strictly dominated strategies leads to

- for Player 2: l strictly dominates r
- after having eliminated r we can further eliminate d, since d is then strictly dominated by u

Important to notice is that here, the prediction we derived relies immensely on the rationality of all players.

Definition 1.4 (A strategy profile)
We call a vector $S = (S_1, \ldots, S_N)$ of dimension N that specifies a strategy for every player in the game a **strategy profile**.

Definition 1.5 (Nash-Equilibrium)
A informal definition for a **Nash-Equilibrium** would be that it is the mutual best response for every player, therefore a strategy profile in which no player can do better by unilaterally changing their strategy.
Defining it formally would mean: a strategy profile $x^* \in S$ is a Nash-Equilibrium if no unilateral deviation in strategy by any single player is profitable for tat player, that is

$$\forall i \in \{1, \ldots, N\}, x_i \in S_i : \quad u_i(x_i^*, x_{-i}^*) \geq u_i(x_i, x_{-i}^*)$$

Example 1.6 (Battle of the sexes)
The next example is a two-player coordination game. Image a couple that agreed to meet this evening, but both individually cannot recall if they will be attending the opera or a football match. The husband would most of all like to go to the football game. The wife would like to go to the opera. Both would prefer to go to the same place rather than different ones.
Hence this game in strategic form could look something like:

M / F	**football**	**opera**
football	$(1,2)$	$(0,0)$
opera	$(0,0)$	$(2,1)$

The two Nash-Equilibriums in this game are $(opera, opera)$ and $(football, football)$ since

$$u_i(opera, opera) \geq u_i(football, opera) \quad \forall i \in \{1,2\}$$

Example 1.7 (The Beauty-Contest)
missing in my notes.

1.1.1 Presentations

todo

Example 1.8 (Guessing-Game / Beauty-Contest)

- $n \geq 2$ players
- Every player guesses a number $b_i \in \{0, 1, 2, \ldots, 100\}$
- Goal is to guess b_i as close as possible to $\frac{p}{n} \cdot \sum_{i=1}^{n} b_i = p \cdot \varnothing, \quad p \in (0,1)$
- Best guess (closes to $p \cdot \varnothing$) wins, in case of a tie a random device that is 'fair' decides who win the price $P > 0$

1. Question: Is $(0, \ldots, 0)$ a Nash-Equilibrium?
Answer: Yes. Assume all bidders except for bidder i bid 0.

- if bidder i bids 0 expected win equals $\frac{1}{n}P$
- if bidder i bids something above 0 his expected profit is going to be 0 as 0 is closer to $p \cdot \varnothing$ then the bet $b > 0$ of player i:

$$p \cdot \varnothing = p\frac{(n-1)0 + 1b}{n} = p\frac{b}{n}$$

$$d\left(b, p\frac{b}{n}\right) > d\left(p\frac{b}{n}, 0\right) \iff \left|b - p\frac{b}{n}\right| > \left|p\frac{b}{n}\right|$$

and since $b > p \cdot \varnothing$ we can simplify this further

$$b > (p \cdot b) \cdot \frac{2}{n} \quad \text{is true because of } n \geq 2 \text{ and } p < 1.$$

2. Question: is $(0, \ldots, 0)$ the unique Nash-Equilibrium here?
Answer: Yes, since:

$$b_i^* \leq \frac{1}{2}\frac{\sum_{j \neq i} b_j^*}{n-1}$$

$$\begin{aligned} \Rightarrow \sum_{i=1}^{n} b_i^* \leq \frac{1}{2}\frac{\sum_{i=1}^{n}\sum_{j \neq i} b_j^*}{n-1} &= \frac{1}{2}\frac{(n-1)\sum_{j=1}^{n} b_j^*}{n-1} \\ &= \frac{1}{2}\sum_{j=1}^{n} b_j^* \end{aligned}$$

$$\iff \sum_{i=1}^{n} b_i^* \leq \frac{1}{2}\sum_{i=1}^{n} b_i^*$$

therefore $(0, \ldots, 0)$ is the only Nash-Equilibrium here.

3. Question: is $(0, \ldots, 0)$ also a strictly dominant strategy?
Answer: No. Looking e.g. at the counterexample:
50 players. 48 of them bid the number 100, bidder 49 bids 0 then the optimal strategy for player 50 is to bid 97.
Therefore 0 is not the best answer and cannot be a strictly dominant strategy.

Example 1.9
something is missing in my notes here

We started with the Dictator-Game, Christoph Engel wrote an interesting book to this topic (Dictator-Games: A meta study (2011)).

Example 1.10 (Ultimatum-Game)
The Ultimatum-Game is a dynamic game under complete information.
We look at two players in two stages. The first player (the proposer (P)) receives a sum of money ($M = 10$) and proposes how to divide the sum between himself (x_p), where $x_p \in \{0, 1, 2, \ldots, 10\}$, and another player ($10 - x_p$). The second player (the responder (R)) chooses to either accept or reject this proposal. If the second player accepts, the money is split according to the proposal. If the second player reject, neither player receives any money.

Lets sum this up again:

- P proposes split up $(x_p, 10 - x_p)$
- R accepets or rejects
  - If R accepts, proposal becomes implemented. P receives x_p and R $10 - x_p$
  - If R rejects, the whole money gets destroyed.

extensive form

A strategy set in this game would have to look like

- Proposer sets a x_p
- Reeciever decides for *any* x_p that might come up if he'd accept or reject that offer.

(strategy needs to specify a complete action plan.)

1. Question: Can the outcome $(5, 5)$ be stabilized as a Nash-Equilibrium outcome?
Answer:

Stichwortverzeichnis