Irrationality in game theory

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Outline

- Introduction
- Reasons for irrationality
- Two main approaches for modeling
- Solutions & Explanation:
  1. Failure of Common Knowledge of Rationality
  2. Reputation and Imperfect Information
  3. Bounded Complexity

Introduction

- What is irrationality in the context of game theory?
- Why is it important?
- Ultimatum game example
- Paradox of rationality

Why is there irrationality?

- Preferences that go beyond monetary payoffs
- Limited cognitive abilities

How to model irrationality?

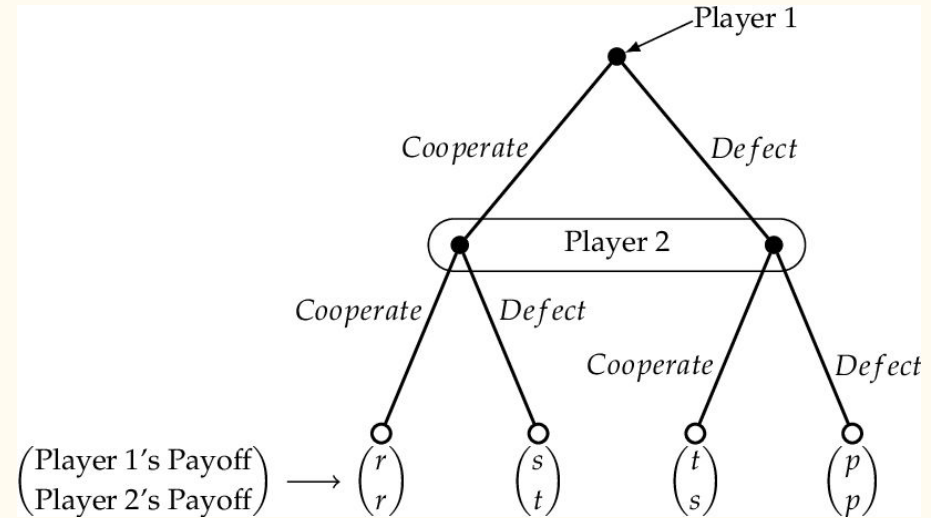- Psychological factors
- Experimental studies

How can irrationality be rational?

- Irrational agents
- Traffic GPS example

Case study: Prisoner dilemma in extensive form

	D	C
D	(1,1)	(4,0)
C	0,4	(3,3)

Solutions & Explanation

- Failure of Common Knowledge of Rationality
- Reputation and Imperfect Information
- Bounded Complexity
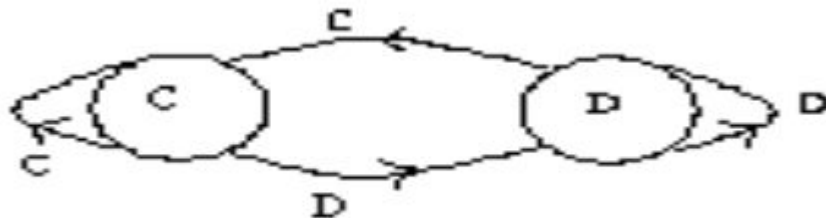
Failure of Common Knowledge Of Rational

- Common knowledge of rationality
- "all players know that they are rational, all know that all know it, and so on ad infinitum."[1]

Reputation and Imperfect Information

- There is a small amount of incomplete information
- A sufficient high probability of other players being irrational can lead to cooperative approaches such as tit for tat.

Bounded Complexity

- Theorem: For any integer k, there is an N0 such that if $N > N0$ and $N1/k \leq \min(l1,l2) \leq \max(l1,l2) \leq Nk$, then there is a (mixed strategy) equilibrium in which the payoffs to each player are at least $3 - 1/k$
  [4]
- Spanish conqueror Cortez

References

[1]https://en.wikipedia.org/wiki/Behavioral_game_theory

[2]https://www.cs.ubc.ca/~kevinlb/teaching/cs532a%20-%202005-6/Projects/YaminHtun.pdf

[3]https://www.semanticscholar.org/paper/Quantum-Conditional-Strategies-for-Prisoners%27-Under-Giannakis-Theocharopoulou/6c9f039236cb36c7d5b17b5c153750fb3a4f3657/figure/0

[4]https://www.sciencedirect.com/science/article/abs/pii/0165176585900266

[5]https://www.investopedia.com/terms/p/paradox-rationality.asp#:~:text=What%20Is%20a%20Paradox%20of,actors%20to%20individually%20act%20irrationally.

[6]https://www.scienceabc.com/social-science/how-does-game-theory-deal-with-irrational-actors.html