

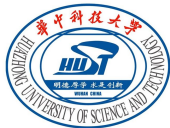
Applied Game Theory

Lecture note 1: Introduction

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This version: September 3, 2018



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- Macroeconomics and Political Economics: More and more game-theoretical tools.
- Auctions, global warming, allocation of college enrollment positions in China, ...

Big Names

- John Nash, Reinhard Selten, John Harsanyi. 1994
- William Vickry. 1996.
- Thomas Schelling, Robert Aumann. 2005
- Leonid Hurwicz, Eric Maskin, Roger Myerson. 2007
- Alvin Roth, Lloyd Shapley. 2012
- Jean Tirole. 2014.
- John von Neumann, John Maynard Smith.
- Only **pure** game theorists are counted above. Game Theory proves helpful in the famous works of other economist, e.g., Samuelson, Arrow, Lucas, Mankiw, ...

Search “solution concept” at wikipedia

• Thomas, D. (1999). Evolutionarily stable sets in mixed-strategy models. *Theor. Pop. Biol.* 55: 66-81.

Topics in game theory [hide]	
Definitions	Normal-form game · Extensive-form game · Escalation of commitment · Graphical game · Cooperative game · Succinct game · Information set · Hierarchy of beliefs · Preference
Equilibrium concepts	Nash equilibrium · Subgame perfection · Mertens-stable equilibrium · Bayesian-Nash · Perfect Bayesian · Trembling hand · Proper equilibrium · Epsilon-equilibrium · Correlated equilibrium · Sequential equilibrium · Quasi-perfect equilibrium · Evolutionarily stable strategy · Risk dominance · Core · Shapley value · Pareto efficiency · Quantal response equilibrium · Self-confirming equilibrium · Strong Nash equilibrium · Markov perfect equilibrium
Strategies	Dominant strategies · Pure strategy · Mixed strategy · Tit for tat · Grim trigger · Collusion · Backward induction · Forward induction · Markov strategy
Classes of games	Symmetric game · Perfect information · Simultaneous game · Sequential game · Repeated game · Signaling game · Cheap talk · Zero-sum game · Mechanism design · Bargaining problem · Stochastic game · <i>n</i> -player game · Large Poisson game · Nontransitive game · Global games · Strictly determined game · Potential game
Games	Prisoner's dilemma · Traveler's dilemma · Coordination game · Chicken · Centipede game · Volunteer's dilemma · Dollar auction · Battle of the sexes · Stag hunt · Matching pennies · Ultimatum game · Rock-paper-scissors · Pirate game · Dictator game · Public goods game · Blotto games · War of attrition · El Farol Bar problem · Fair division · Fair cake-cutting · Cournot game · Deadlock · Diner's dilemma · Guess 2/3 of the average · Kuhn poker · Nash bargaining game · Screening game · Prisoners and hats puzzle · Trust game · Princess and monster game · Monty Hall problem · Rendezvous problem
Theorems	Minimax theorem · Nash's theorem · Purification theorem · Folk theorem · Revelation principle · Arrow's impossibility theorem
Key figures	Albert W. Tucker · Amos Tversky · Ariel Rubinstein · Daniel Kahneman · David K. Levine · David M. Kreps · Donald B. Gillies · Drew Fudenberg · Eric Maskin · Harold W. Kuhn · Herbert Simon · Hervé Moulin · Jean Tirole · Jean-François Mertens · John Harsanyi · John Maynard Smith · John Nash · John von Neumann · Kenneth Arrow · Kenneth Binmore · Leonid Hurwicz · Lloyd Shapley · Melvin Dresher · Merrill M. Flood · Oskar Morgenstern · Paul Milgrom · Peyton Young · Reinhard Selten · Robert Aumann · Robert B. Wilson · Roger Myerson · Samuel Bowles · Thomas Schelling · William Vickrey
See also	All-pay auction · Alpha-beta pruning · Bertrand paradox · Bounded rationality · Combinatorial game theory · Confrontation analysis · Cooperation · List of game theorists · List of games in game theory · No-win situation · Topological game · Tragedy of the commons · Tyranny of small decisions

Figure 1: Search “solution concept” at wikipedia.

What if you want to go deeper?

- The two textbooks recommended.

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- Handbook of Game Theory with Applications. Vol 1-4.
- Recent papers in top journals.

Interesting, popular, but commonly misused

王宝强带绿帽子，在博弈论里，是N人博弈结构。在这老王家里，是三人博弈，王宝强，马蓉和宋吉吉。

在三人博弈里面，王宝强和马蓉看似合作博弈，他们有婚姻的约束协议；马蓉和宋吉吉的博弈看似非合作博弈，他们没有利益捆绑的明文协议。

但是实际上，王宝强和马蓉的婚姻协议，可能会有附加条款，马蓉是不能平分老王家财产，只能凭劳动付出获得回报，比如生一个孩子多少价格等，所以在三角恋里，他们是非合作博弈。

马蓉和宋吉吉，可能会有私下默契，这个要看默契程度。从目前情况来看，两人已经有频繁的交配体验，默契程度非常深，属于合作博弈。

马蓉和宋吉吉是合作博弈，而且，是完全信息博弈。王宝强和马蓉宋吉吉的博弈，属于非完全信息博弈，处于劣势。

因此，在这三人博弈里，马蓉和宋吉吉选择了交配合作的决策，王宝强由于信息不对称，选择了为他们挣钱的决策。这个博弈，一开始是一个静态博弈，处于均衡状态。马蓉和宋吉吉继续交配，王宝强继续演戏挣钱。

Figure 2: Misuse of Game-theoretical methodologies: an example.

Interesting, popular, but widely misused

杨慧做了一个自己认为最优的选择。向王宝强告密马蓉和宋吉吉的交配行为。

这时候，王宝强已经打破信息不对称，属于完全博弈。他跟马蓉以前的合作博弈，因为绿帽子，就变成了非合作博弈。

这个时候的三人博弈，已经不是静态博弈了，是动态博弈。只是马蓉和宋吉吉可能不知道王宝强的信息，还误认为是非完全信息博弈。

王宝强得到杨慧告密后，就立刻采取行动。一方面收集马蓉和宋吉吉的交配证据；一方面变更公司股权，清除掉马蓉和宋吉吉股份。

终于在万事具备的条件下，微博公告天下，离婚马蓉，开除宋吉吉。动态博弈又走向了静态博弈，马蓉和宋吉吉由于是王宝强的附属，在王宝强选择离婚和开除决策后，只能选择离开的决策。

这个博弈从静态—动态—静态，已经走到最后的均衡状态。

Figure 3: Misuse of Game-theoretical methodologies: an example (continued). Source:

<http://money.163.com/16/0816/09/BUJ4LJ4A00253B0H.html>