

Theory of Games: A brief review.

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Economics has been criticized for a while for its outdated theory that takes for granted the expected behavior of economic agents such as firms and households. The famous expression “ceteris paribus” used by economists when formulating economic theory considers that we can keep constant the rest of the economy whenever studying one aspect of it. However, in the real world it is impossible to treat economies in such manners. In order to best approximate economic behavior of agents to better assess future patterns, economists and mathematicians rely on Game theory.

1 What is Game Theory?

Game Theory is a branch of applied mathematics that studies strategic interactions in social situations among competing individuals, often called “players”. Game Theory was first introduced in the 1920s by John von Neumann in his paper “Theory of Games of Strategy” and later on in his book with Oskar Morgenstern titled “Theory of Games and Economic Behavior”.

2 Two person zero sum games

A zero-sum game is a mathematical representation of a situation involving two competing entities. In these situations, the results are often an advantage for one side and a loss for the other.

3 Non zero-sum games

Non zero-sum games differ from zero sum games in that there is no single optimal strategy that is preferable. Non zero-sum games are any situation where a positive payoff for a winner does not necessarily require an equally negative outcome for the loser of the game.

4 Nash Equilibrium and Prisoner’s dilemma explained:

In Game Theory, the competing players have one single goal: gain advantage by strategically planned moves (like in chess). However, in many situations a cooperation (often illegal [not necessarily]) between entities can take place in order for them to both benefit.

The concept of the prisoner’s dilemma involves a game in which the players are prevented from cooperating any further and in which each has a dominant strategy that leaves them both worse off than if they could cooperate (think of it like interrogation rooms for the parties of a committed crime that are pressured on ratting out each other for a more lenient sentence or penalty).

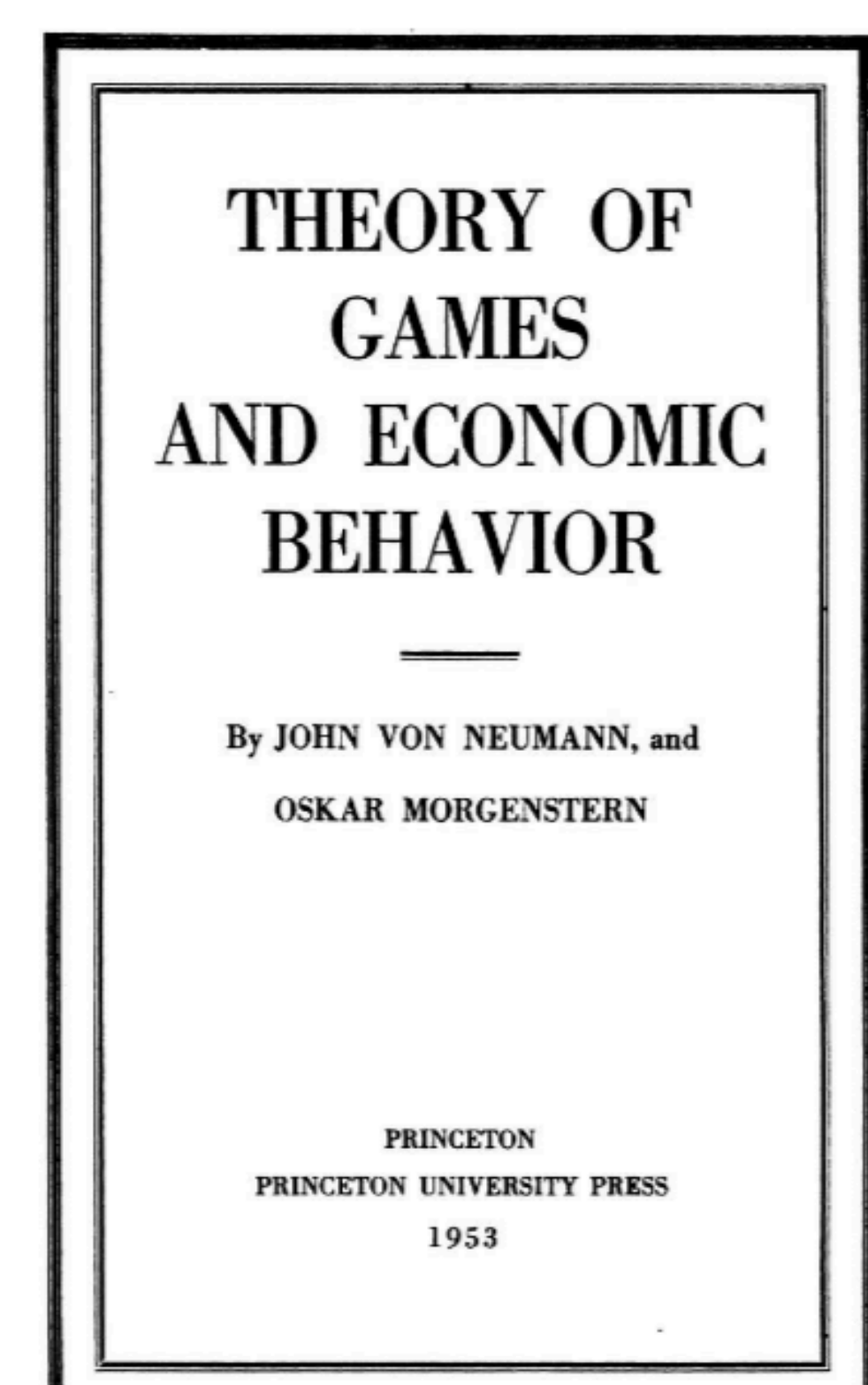
Nash equilibrium, developed by mathematician John Nash is a concept that represents the result of all players playing their best strategy, given what their competitors are doing or planning on doing.

		Prisoner 1	
		Confess	Not confess
Prisoner 2	Confess	-6, -6	-9, -1
	Not Confess	-1, -9	0, 0

Payoff matrix representing the concept of prisoner’s dilemma



John von Neumann



6 Conclusion:

To conclude, we can say that many tools such as Game Theory serve as predictive models for the behavior of economic agents. It is important to note however, that the behavior of humans and firms can never be perfectly predicted or expected. Thus, Game Theory is a complex but important field in applied mathematics that approximates how situations and interactions in economies might play out in the future and how to model them quantitatively and mathematically using modern set and graph theory.