Introduction

A Game is a competitive activity, in which players contend with each other according to a set of rules. Game Theory in general, helps us analyse situations where decision makers interact. Like other sciences, it too is based on models.

A model is an abstraction used to understand observations. Its assumptions need to be chosen carefully, and must also be fairly simple, capable of ignoring irrelevant details. Models cannot be judged absolutely; they must be judged relative to their purpose.

Mathematical symbols will be used to describe models, but not concepts to avoid the inefficiency of verbal descriptions.

Theory of Rational Choice

Decision maker chooses the best action according to her preferences, among the actions given to her. OR The action chosen by the decision-maker is atleast as good as all the other available actions.

The set of actions is denoted by a set A, and at any turn, a player has to choose an action from a subset of A. To denote the consistent preferences between choices, we use a payoff function. Payoff functions link a number to each action based on preference. More preferred actions get higher numbers. But do note that the information is purely ordinal.

While the theory of rational choice isn't always correct, it is vastly superior to most theories as it is incredibly general.

Nash Equilibrium

A strategic game consists of a set of players, a set of actions for each of them, and a preference over the action profile for each of them.

Time is absent, players choose their actions simultaneously, without caring about other players' actions.

Example: Prisoner's Dilemma and other situations

Basically, there are two players A and B, with two actions x and y. The combination of actions chosen by both players is what determines the outcome. For example, if both prisoners stay quiet, they can get off with 1 year each in prison, if one finks, he walks free and the other gets 3 years, and if both fink, they both get 3 years. Thus, the most desirable situation for A is when he finks and B stays quiet, while the least desirable is when both of them fink. This can be shown in a table. This model can be used for many other situations – Working on a joint project, duopoly, arms race etc.

		Suspect 2	
		Quiet	Fink
Suspect 1	Quiet	2, 2	0, 3
	Fink	3, 0	1, 1

Example: Stag Hunt

There are many hunters, and they can each choose whether to pursue a stag or a hare. If all focus on stag they can catch it, which is the best outcome, but if even one chooses to go to the hare, only he gets a hare and the rest return empty. The best scenario is for all to cooperate, however the fear that if one doesn't cooperate, they'll all suffer prompts them to betray.