**Game Theory**

Game theory is a theory of social interaction, which attempts to explain the interaction people have with one another. As the name of the theory suggests, game theory sees human interaction as just that: a game. John Nash, the mathematician who was featured in the movie [*A Beautiful Mind*](http://math.about.com/library/weekly/aa012002a.htm) is one of the inventors of game theory along with mathematician John von Neumann.

Game theory was originally an economic and mathematical theory that predicted that human interaction had the characteristics of a game, including strategies, winners and losers, rewards and punishment, and profits and cost. It was initially developed to understand a large variety of economic behaviors, including behavior of firms, markets, and consumers. The use of the game theory has since expanded in the social sciences and has been applied to political, sociological, and psychological behaviors as well.

Game theory was first used to describe and model how human populations behave. Some scholars believe that they can actually predict how actual human populations will behave when confronted with situations analogous to the game being studied. This particular view of game theory has been criticized because the assumptions made by the game theorists are often violated. For example, they assume that players always act in a way to directly maximize their wins, when in reality this is not always true. Altruistic and philanthropic behavior would not fit this model.

Example of Game Theory

We can use the interaction of asking someone out for a date as a simple example of game theory and how there are game-like aspects involved. If you are asking someone out on a date, you will probably have some kind of strategy to “win” (having the other person agree to go out with you) and “get rewarded” (have a good time) at a minimal “cost” to you (you don’t want to spend a large amount of money on the date or do not want to have an unpleasant interaction on the date).

Elements of a Game

There are three main elements of a game:

* The players.
* The strategies of each player.
* The consequences (payoffs) for each player for every possible profile of strategy choices of all players.

Types of Games

There are several different kinds of games that are studies using game theory:

* [*Zero-sum game*](http://sociology.about.com/od/Z_Index/g/Zero-Sum-Game.htm): The players’ interests are in direct conflict with one another. For example, in football, one team wins and the other team loses. If a win equals +1 and a loss equals -1, the sum is zero.
* *Non-zero sum game*: The players’ interests are not always in direct conflict, so that there are opportunities for both to gain. For example, when both players choose “don’t confess” in Prisoner’s Dilemma (see below).
* *Simultaneous move games*: Players choose actions simultaneously. For example, in the Prisoner’s Dilemma (see below), each player must anticipate what their opponent is doing at that moment, recognizing that the opponent is doing the same.
* *Sequential move games*: Players choose their actions in a particular sequence. For example, in chess or in bargaining/negotiating situations, the player must look ahead in order to know what action to choose now.
* *One-shot games:*: The play of the game occurs only once. Here, the players are likely to not know much about each other. For example, tipping a waiter on your vacation.
* *Repeated games*: The play of the game is repeated with the same players.

Prisoner’s Dilemma

The prisoner’s dilemma is one of the most popular games studied in game theory that has been portrayed in countless movies and crime television shows. [The prisoner’s dilemma](http://statistics.about.com/od/ProbHelpandTutorials/a/What-Is-The-Prisoners-Dilemma.htm) shows why two individuals might not agree, even if it appears that it is best to agree. In this scenario, two partners in crime are separated into separate rooms at the police station and given a similar deal. If one testifies against his partner and the partner stays quiet, the betrayer goes free and the partner receives the full sentence (ex: ten years). If both remain silent, both are sentences for a short time in jail (ex: one year) or for a minor charge. If each testifies against the other, each receives a moderate sentence (ex: three years). Each prisoner must choose to either betray or remain silent, and the decision of each is kept from the other.

The prisoner’s dilemma can be applied to many other social situations, too, from political science to law to psychology to advertizing. Take, for example, the issue of women wearing make-up. Each day across America, several million woman-hours are devoted to an activity with questionable benefit for society. Foregoing makeup would free up fifteen to thirty minutes for each woman every morning. However, if no one wore makeup, there would be great temptation for any one woman to gain an advantage over others by breaking the norm and using mascara, blush, and concealer to hide imperfections and enhance her natural beauty. Once a critical mass wears makeup, the average facade of female beauty is artificially made greater. Not wearing makeup means foregoing the artificial enhancement to beauty. Your beauty relative to what is perceived as average would decrease. Most women therefore wear makeup and what we end up with is a situation that is not ideal for the whole or for the individuals, but is based on rational choices by each individual.

Assumptions Game Theorists Make

* The payoffs are known and fixed.
* All players behave rationally.
* The rules of the game are common knowledge.