Game theory

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Game theory deals with the analysis of strategic situations, defined as situations of inter-dependence between rational actors, through the use of mathematical models. It has been extremely useful in the field of international relations as it highlights the issues of mistrust and the lack of cooperation that emerge in situations of conflicting interests.

These games involve two players, who both have two available options regarding their course of action. There is also the precondition that both players are rational regarding their decision-making process. There are three types of games: zero-sum, non-zero-sum and mixed ones. We will analyse the following games: the Chicken game (mixed), the prisoner's dilemma (non-zero-sum) and the war of attrition game (zero-sum= a competition context inside of which each player gets exactly what the other player loses).

Chicken game

The Chicken game theory is a mixed one in terms of sum. The name "chicken" has its origins in a game in which two drivers drive towards each other on a collision course. As the two drivers speed towards each other, the first driver to turn off the road is the "chicken" and subsequent loser of the game.

In the Chicken model, the notion of cooperating is equated to swerving off the road, while defecting is equated to continuing straight toward the opposing car. For each player, the choice to defect while the other cooperates is the best possible decision. This implies that the actor who defects wins the game while the cooperating actor swerves off the road and loses the game.

The second-best outcome for either player would be mutual cooperation to prevent the dangers and costs of defecting. The second worst outcome would be cooperating and losing the game while one's opponent defects and wins. The worst outcome would be mutual defection, which would result in a head-on collision and extreme damage for both sides.

In international politics, the chicken game refers to a dangerous game in which countries try not to compromise until the enemy backs up first. The Chicken game theory was used in the Cuban Missile Crisis during the Cold War to depict the clash between the two superpowers. In that context, the worst outcome would be a nuclear war.

Prisoner's dilemma

The prisoner's dilemma is a non-zero-sum game. It demonstrates the cooperation problems that arise in circumstances of antagonistic interests and lack of information. It is a paradigm in which

the reward for unilateral noncooperation exceeds both the benefit from mutual cooperation and the cost of mutual conflict.

Two prisoners, A and B, suspected of committing a robbery together, are isolated and urged to confess. Simultaneously, the prosecutors offer each prisoner a bargain. Each prisoner can either betray the other by testifying that the other committed the crime or cooperate with the other by remaining silent. Both prisoners, however, know the consequences of their decisions: (1) if both confess, both go to jail for five years; (2) if neither confesses, both go to jail for one year; and (3) if one confesses while the other does not, the confessor goes free and the silent one goes to jail for 20 years.

Although A cannot be sure what B will do, he knows that he does best to confess when B confesses and when B remains silent; B will reach the same conclusion. So, the solution would seem to be that each prisoner does best to confess and go to jail for five years. Paradoxically, however, the two robbers would do better if they both adopted the apparently irrational strategy of remaining silent.

The central characteristic of this game is that, although the parties could enjoy mutual benefits by cooperating, the logic of their situation forces them into conflict and mutual losses. Assuming both players are rational and act only according to self-interest, there is no way of escaping this outcome.

An example of a real prisoner's dilemma would be a disarmament agreement in which the two states end up breaching the deal's terms as they don't trust each other. That is not the best solution since the acquisition of weapons has a substantial economic cost. Still, it is not the worst outcome in the sense that none will end up being deceived.

War of attrition

The war of attrition game is a zero-sum game. It describes every situation in which each actor expects the other to make the wrong decision. The game depicts a conflict scenario between guerilla fighters (player 2) and the tactical army (player 1). The guerillas have the advantage in guerilla warfare through attrition, while the army is better structured for a battle in its fortified position. There are, consequently, four possible outcomes depending on each player's choices.

If player 2 conducts an attrition operation in the fortified position of player 1, then the latter will acquire small gains (+0.5) while player 2 will have minor losses (-0.5). If player 2 makes the mistake of advancing straight to the fortified position for a battle, player 1 will emerge victorious (+8) while player two will have maximum losses (-8).

In the case where the army (player 1) commits the mistake of going out of its position and confronts the attrition strategy of the guerillas (player 2), then the latter will deal the biggest blow (+7) to player 1, who will be destroyed (-7). The last possible outcome is when player 1 chooses wrongly to fight out of its fortified position (-5), and player 2 also commits the mistake

of giving a proper battle (+5). Here, the winner is player 2 due to the terrain advantage, but the guerillas did not achieve maximum gains because they did not use their most effective strategy.

The game's gains and losses urge both players to adopt a waiting strategy. Therefore, the most logical thing is that they will end up in the first outcome (+0.5,-0.5). That is because each will wait until the other commits the big mistake to acquire maximum gains.

Sources:

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