Dominant strategy

The dominant strategy in game theory refers to a situation where one player has superior tactics regardless of how their opponent may play. Holding all factors constant, that player enjoys an upper hand in the game over the opposition. It means, regardless of the strategies employed by the opponent, the dominant player will always dictate the outcome.

In game theory, players employ different independent strategies to optimize their decision-making with the goal of beating the opponent. Players in an oligopolistic market, military, managers, consumers, or games like the chase, often use game theory as a strategic tool.

In game theory, the outcomes of the actors are different depending on their actions. Some players enjoy an upper hand, while others are less fortunate. The dominant strategy describes a state where one of the players has a superior tactic that always leads to a winning outcome, despite the opponent's employed choice of strategy.

Dominant Strategy Outcomes

In game theory, the following are the outcomes players can expect:

1. **Strictly Dominant Outcome**

In some situations, one player enjoys a strict advantage over their opponent. It means that, no matter how good the losing party's tactic is, the dominant strategy will always prevail. Here, there is no other possible strategy the opponent can use to alter their odds.

2. **Weakly Dominant Outcome**

In a weakly dominant outcome, the dominant player dominates the game but against some strategies, only weakly dominates.

3. **Equivalent Outcome**

In an equivalent outcome, none of the actors benefit or lose against each other. They each choose the one optimal result that is fair for both players. In case one of the players selects the alternative, it would mean an outlandish gain or loss.

4. **Intransitive Outcome**

In an intransitive outcome, none of the above three outcomes are experienced – no equivalent, strictly, or weak dominant outcome results. The available outcome happens by chance. Either player can win, while the other loses depending on the strategy employed. Therefore, in this outcome, there is no well-defined approach to point to the dominance strategy.

Practical Example

The prisoner's dilemma is a well-known example used to depict the predicament of two criminals, A and B, when facing persecution – i.e., car theft. During the trials, the prosecutor believes the two suspects might have committed an earlier crime but were not convicted – i.e., burglary. Since there is no hard evidence, the DA employs game theory to force a confession out of the two. They are offered a deal to rat each other out. The following are the terms:

- For the car theft crime, which there is hard evidence, they will face a jail term of two years.
- If A rats out B by confessing to the burglary crime, the sentence will be reduced to one year, while B gets seven years for being uncooperative. On the flip side, if A denies, but B confesses, the sentence for A will be seven years, while B gets only one year.
- A similar deal is offered to Suspect B.
- However, if they both confess to the burglary crime, the jail term will be reduced to three years.

The above information can be plotted in a payoff matrix as below:

		Suspect B			
		Confess		Deny	
Suspect A	Confess	3	3	1	7
	Deny	7	1	2	2

The above example represents an equivalent outcome. This is because the dominant strategy for Suspect A and Suspect B will be to confess. Either suspect will always have a dilemma to choose between three years versus seven years and one year versus two years.

Interpretation

In case they committed the burglary, the only rational option available would be to choose the confession strategy. Neither will want to gamble with the loyalty of the other. This is because the alternative is worse – seven years versus a one-year jail term. They will both likely opt for a confession, and this stalemate situation is referred to as the Nash Equilibrium.