

Glossary of game theory terms

Action: a pure strategy.

Deficient equilibrium: An equilibrium is deficient if there exists another outcome which is preferred by every player.

Common interest game: a game where there is a unique *payoff profile* that strongly Pareto dominates all other payoff profiles (and this payoff profile may be achieved via several strategy profiles). See Aumann and Sorin (1989).

Common knowledge: Common knowledge (CK) in game theory often comes with a certain order: zero-order CK of X is just the assumption that X prevails for every player (e.g. zero-order common knowledge of complete information (CKCI) means that every player has complete information); first-order CK is the assumption that every player knows that X prevails for every player (e.g. first-order CKCI means that every player knows that every player has complete information); in general, (n)th-order CK is the assumption that (n-1)th-order CK is known by every player. If no order is specified, it is assumed that the order is infinite (this produces an infinite recursion of shared assumptions).

Common knowledge of rationality (CKR): Following the definition of common knowledge (see above), first-order CKR is the assumption that every player knows that every player is rational; (n)th-order CKR is the assumption that (n-1)th-order CKR is known by every player. If no order is specified, it is assumed that the order of CKR is infinite. See Aumann (1976) for a formal definition.

Complete information: In a game of complete information it is assumed that players not only know the rules of the game and their own payoff function, but also their counterparts' payoff functions (see section 2.2.1).

Evolutionary stable strategy: Informally, an evolutionarily stable strategy is a strategy which, if adopted by a population of players, cannot be invaded by any alternative strategy (see section 2.3.1).

Finite game: a game with finitely many players, each of which has a finite set of pure strategies.

Individually-rational outcome: An outcome giving each player at least their maximin payoff, i.e. the largest payoff that they can guarantee obtaining (regardless of the opponents' moves) in a single-stage game using pure strategies.

Instrumentally rational: An instrumentally rational player has unlimited computational capacity devoted to maximise her individual payoff function. There are various degrees of rationality in game theory; see section 2.2.2.

Maximin payoff: the largest possible payoff a player can guarantee herself (regardless of the opponents' moves) in a single-stage game using pure strategies. The maximin payoff for each player in the one-shot Prisoner's Dilemma is the payoff obtained when both players defect.

Mixed strategy: A probability distribution P over the set of pure strategies. It is understood that a player using a mixed strategy chooses one pure strategy randomly according to P .

Mutual belief: A proposition X is mutual belief among a set of players if each player believes X . Mutual belief by itself implies nothing about what, if any, beliefs anyone attributes to anyone else (Vanderschraaf and Sillari, 2007).

Mutual interest game: a game where there exists a unique *pure strategy profile* that gives the highest possible payoff to every player. All mutual interest games are, in particular, common interest games (Aumann and Sorin, 1989).

NxM game: A normal form game for two players, where one player has N possible actions and the other one has M possible actions. The payoff function in NxM games can be neatly represented with a matrix.

Nash equilibrium (Nash, 1951): a set of strategies such that no player, knowing the strategy of the other(s), could improve her expected payoff by changing her own strategy. Every finite game has at least one Nash Equilibrium (possibly in mixed strategies).

Outcome: a particular combination of pure strategies, one for each player, and their associated payoffs.

Pareto inefficient: An outcome is Pareto inefficient if there is an alternative in which at least one player is better off and no player is worse off.

Perfect information: Informally, in (sequential) games of perfect information, the actions taken by every player are instantaneously known by every other player (e.g. chess). Complete information does not imply perfect information.

(Strictly) dominated strategy: For a player A, strategy S_A is (strictly) dominated by strategy S^*_A if for each combination of the other players' strategies, A's payoff from playing S_A is (strictly) less than A's payoff from playing S^*_A (Gibbons, 1992, p. 5).

Subgame: Informally, a subgame is a subset or piece of a sequential game beginning at some node such that every previous action undertaken by every player at every point is common knowledge.

Subgame perfect equilibrium (Selten, 1975): A strategy profile is a subgame perfect equilibrium if it represents a Nash equilibrium of every subgame of the original game (whether or not the subgame is reached along the equilibrium path induced). Subgame perfect equilibrium is a refinement of the concept of Nash equilibrium that eliminates non-credible threats in sequential games.

Tit-for-Tat (TFT): This is the strategy consisting of starting by cooperating, and thereafter doing what the other player did on the previous move.