What Is a Zero-Sum Game?

A zero-sum game is any interaction in which one person's gain results in an equivalent loss by the other participant. No net gain is achieved.

The concept of a zero-sum game is prominent in game theory. Chess is an example of a zero-sum game, in which one person wins at the expense of another.

Some transactions in the financial market are zero-sum games. Trading in options and futures are examples. Every contract is an agreement between two parties. Every time a contract is written, one party wins and the other party loses.

In the financial markets, there may be millions of participants in a zero-sum game. Assets can be bought and sold among millions of investors, redistributing wealth but not adding to the sum total.

- A zero-sum game ends with a winner and a loser but no net change.
- A zero-sum game can have just two participants or millions.
- In financial markets, futures and options contracts are considered zero-sum games because they end with one participant transferring wealth to the other participant. There's a winner and a loser, but no net change in wealth.
- Most transactions are non-zero-sum games because the result can be beneficial to both parties.

Zero-sum games are found in many contexts. Poker is a zero-sum game since the sum of the amounts won by some players equals the combined losses of other players. The pot does not grow, it is simply redistributed.

Games like chess and tennis, where there is one winner and one loser, are also zero-sum games.

Zero Sum vs. Positive Sum Games

Zero-sum games are the opposite of win-win situations, such as a trade agreement that significantly increases trade between two nations. There also can be lose-lose situations, such as a breakdown in a diplomatic negotiation that ends with no positive outcome for either party. In real life, things are not always so obvious, and gains and losses can be difficult to quantify.

The Perfect Competition

When applied to economics, there are multiple factors to consider when understanding a zero-sum game. A zero-sum game assumes a version of perfect competition and perfect information; both opponents in the model have all the relevant information to make an informed decision.

Taking a step back, most transactions or trades are inherently non-zero-sum games because when two parties agree to trade they do so with the understanding that the goods or services they are receiving are more valuable than the goods or services they are trading for it, after transaction costs.

This is called positive-sum, and most transactions fall under this category.

Many well-known game theory examples like the prisoner's dilemma, the Cournot Competition, the Centipede Game, and Deadlock are non-zero sum games.

Zero-Sum Games and Game Theory

Game theory is a complex theoretical study in economics. The 1944 groundbreaking work "Theory of Games and Economic Behaviour," written by Hungarian-born American mathematician John von Neumann and co-written by Oskar Morgenstern, is the foundational text.

Game theory is the study of the decision-making process between two or more intelligent and rational parties. It can be used in a wide array of economic fields, including experimental economics, which tests economic theories in a controlled setting.

When applied to economics, game theory uses mathematical formulas and equations to predict outcomes in a transaction, taking into account many different factors including gains, losses, optimality, and individual behaviors.

In theory, a zero-sum game is solved via three solutions, perhaps the most notable of which is the Nash Equilibrium put forth by John Nash in a 1951 paper titled "Non-Cooperative Games."

The Nash equilibrium states that two or more opponents in the game—given knowledge of each other's' choices and that they will not receive any benefit from changing their choice—will therefore not deviate from their choices.

Example of a Zero Sum Game

The game of matching pennies is often cited as an example of a zero-sum game, according to game theory. The game involves two players, A and B, simultaneously placing a penny on the table. The payoff depends on whether the pennies match or not. If both pennies are heads or tails, Player A wins and keeps Player B's penny. If they do not match, Player B wins and keeps Player A's penny.

Matching pennies is a zero-sum game because one player's gain is the other's loss. The payoffs for Players A and B are shown in the table below, with the first numeral in cells (a) through (d) representing Player A's payoff, and the second numeral representing Player B's playoff. As can be seen, the combined playoff for A and B in all four cells is zero.

A / B	Heads	Tails
Heads	(a) +1, -1	(b) -1, +1
Tails	(c) -1, +1	(d) +1, -1

How Zero Sum Games Apply to Finance

In the stock market, trading is often thought of as a zero-sum game. However, because trades are made based on future expectations and traders have different risk preferences, a trade can be mutually beneficial.

Investing long-term is considered a positive-sum situation because capital flows facilitate production and create jobs that then provide savings and income, fueling investment to continue the cycle.

Options and futures trading is the closest practical example to a zero-sum game scenario because the contracts are agreements between two parties, and, if one person loses, the other party gains.

Generally, if the price of that commodity or underlying asset rises (usually against market expectations) within a set time frame, an investor can close the futures contract at a profit. Thus, if an investor makes money from that bet, there will be a corresponding loss, and the net result is a transfer of wealth from one investor to another.

Does Zero-Sum Game Mean All or Nothing?

Yes. Often the terms zero-sum and "all or nothing" are used to describe the same phenomenon, in which there can only be one winner, at the expense of the loser(s).

Why Is It Called Zero-Sum?
The term zero-sum comes from the fact that some situations require winners to gain at the expense of losers while the net value of the system remains unchanged.

For example, a winner with +3 would result in, say, two losers, one with -1 and one with -2. The sum is zero (3 - 2 - 1).

What Is a Zero-Sum Game in Relationships?

In the context of personal relationships, a zero-sum game implies that there can only be one winner at the expense of the other person or people. This can create conflict and **tension.**