GAME THEORY

DEFINITION:

Game theory is the branch of applied mathematics that provides tools for analyzing situations in which parties, called players, make decisions that are interdependent. This interdependence causes each player to consider the other player's possible decisions, or strategies, in formulating strategy

Game theory is a framework for understanding choice in situations among competing players. Game theory can help players reach optimal decision-making when confronted by independent and competing actors in a strategic setting.

Principles of game theory .

The central purpose of game theory is to study the strategic relations between supposedly rational players. It thus explores the social structures within which the consequences of a player's action depend, in a conscious way for the player, on the actions of the other players.

EXAMPLE OF GAME THEORY

Everything is a game, poker, chess, soccer, driving, dating, stock market advertising, setting prices, entering new markets, building a reputation bargaining, partnerships, job market search and screening designing contracts, auctions, insurance, environmental regulations international relations, trade agreements, electoral campaigns, Most modern economic research includes game theoretical elements

Game theory has been used to analyze parlour games, but its applications are much broader.

TYPES OF GAME THEORY

Types of games Games can be classified according to certain significant features, the most obvious of which is the number of players. Thus, a game can be designated as being a one-person, two-person, or n-person (with n greater than two) game,

- One-person games
- Two person zero sum game

ONE PRESON GAME THEORY

One-person games are also known as games against nature. With no opponents, the player only needs to list available options and then choose the optimal outcome.

TWO PERSON ZERO SUM GAME

Two person zero sum game (with two players) The game in which there are exactly two player and the interest of the players completely opposed are referred as two-person zero sum games. They are called zerosum games because one player wins whatever the other player loses.

PAYOFF MATRIX

represented in The payoff in term of gain or loss ,when players select their particular strategies can be the form of a matrix called the payoff matrix

SADDLE POINTS

In a zero-sum matrix game, an outcome is a saddle point if the outcome is a minimum in its row and maximum in its column.

GAMES WITH SADDLE POINTS

The selection of an optimal strategy by each player without the knowledge of the competitors strategy is the basic problem of playing games.

If the maximum value equals the minimum value then the game is said to have a saddle points and the corresponding strategies are called optimal strategies

GAMES WITHOUT SADDLE POINTS

The optimal strategy mixture for each player may be determined by assinging to each strategy is probability of being chosen. In certain case, there is no pure strategy solution for games i.e, no saddle points

GRAPHICAL METHOD

Linear programming problem that have only two variables it is possible that the entire set of feasible solution can be displayed graphically by plotting linear constrains to locate a best optimum solutoin. The technique used to identify the opyimum solution called the graphical solution technique.

Steps involved

- Step 1: Formulate the LP (Linear programming) problem. ...
- Step 2: Construct a graph and plot the constraint lines. ...
- Step 3: Determine the valid side of each constraint line. ...
- Step 4: Identify the feasible solution region. ...
- Step 5: Plot the objective function on the graph. ...
- Step 6: Find the optimum point.

SIMPLEX METHOD

The Simplex method is an approach to solving linear programming models by hand using slack variables, tableaus, and pivot variables as a means to finding the optimal solution of an optimization problem.

To solve a linear programming model using the Simplex method the following steps are necessary:

- Standard form
- Introducing slack variables
- Creating the tableau
- Pivot variables
- Creating a new tableau
- Checking for optimality
- Identify optimal values

MARKOV CHAIN ANALYSIS

Markov analysis is a method used to forecast the value of a variable whose predicted value is influenced only by its current state, and not by any prior activity. In essence, it predicts a random variable based solely upon the current circumstances surrounding the variable.

Markov analysis is specifically applicable to systems that exhibit probabilistic movement from one state (or condition) to another, over time. For example, Markov analysis can be used to determine the probability that a machine will be running one day and broken down the next, or that a customer will change brands of cereal from one month to the next

Advantages and Disadvantages of Markov Analysis

The primary benefits of Markov analysis are simplicity and out-of-sample forecasting accuracy. Simple models, such as those used for Markov analysis, are often better at making predictions than more complicated models.

This result is well-known in econometrics.

Unfortunately, Markov analysis is not very useful for explaining events, and it cannot be the true model of the underlying situation in most cases. Yes, it is relatively easy to estimate conditional probabilities based on the current state. However, that often tells one little about why something happened.

SUMMERY OF MARKOV PROPERTIES

- Property 1: The transition probabilities for a given beginning state of the system sum to one.
- Property 2: The probabilities apply to all participants in the system.
- Property 3: The transition probabilities are constant over time.
- Property 4: The states are independent over time.

REPLACEMENT AND MAINTENANCE MODELS

REPLACEMENT MODEL

Replacement models are concerned with the problem of replacement of machines, individuals, capital assets, etc. due to their deteriorating efficiency, failure, or breakdown.

It is evident that the study of replacement is a field of application rather than a method of analysis. Actually, it is concerned with methods of comparing **alternative** replacement policies.

The various types of replacement problems can be broadly classified in following categories:

- Replacement of items whose efficiency deteriorates with time, e.g., machine, tools, etc.
- Replacement of items that fail suddenly and completely like electric bulbs & tubes.
- Replacement of human beings in an organisation or staffing problem.
- Replacement of items may be necessary due to new researches and methods; otherwise, the system may become outdated.

MAINTENANCE MODEL

A firm wants to be in the same business competitively, it has to take decision on whether to replace the old equipment or to retain it by taking the cost of maintenance and operation into account.

TYPES OF MAINTYENANCE

Maintenance activity can be classified into two types: preventive maintenance and breakdown maintenance

- Preventive maintenance
- Breakdown maintenance

Preventive maintenance (PM) is the periodical inspection and service activities which are aimed to detect potential failures and perform minor adjustments or repairs which will prevent major operating problems in future.

Breakdown maintenance is the repair which is generally done after the equipment has attained down state. It is often of an emergency nature which will have associated penalty in terms of expediting cost of maintenance and down time cost of equipment