Decision Theory

By
Ms. V. V. Pawar
Associate Professor

S1 Only change name-no any ingredients No change in price

S2 Moderate change , small change in price

S3 A small change ,negligible change in price

The three possible states of nature

N1- High increase in sale
N2- No change in sale
N3- decrease in sale

Basic Terminologies

- **Decision maker**-Refers to an individual or a group of individuals responsible for making decisions.

- **Goals to be achieved**- objectives which decision maker wants to achieve.

- **Courses of action**-Alternative courses of action or strategies which are available for decision making.

- **Events/ States of nature**-Exhaustive list of possible future events.

- **Payoff**-It is effectiveness associated with specified combination of course of action and state of nature.

- These are also called as profits or conditional values.

Payoff table-

- It lists the state of nature and a given set of courses of action, For each course of action and strategy a payoff is determined.

States of nature	Courses of action			
	A1	A2	--- ------	An
S_1	a_{11}	a12	--------	a_{1n}
S_2	a_{21}	a_{22}		a_{2n}
S_3				
S_m	a_{m1}	a_{m2}		a_{mn}

- Opportunity loss table-It is a numerical difference between the optimal outcome and actual outcome for a given decision

Steps in decision making

- Determine various courses of action from which final decision is to be made.

- Identify the possible states of nature

- Formulate the payoff table.

- Construct the regret or opportunity loss table .

- Select the optimum decision criterion, which results in largest payoff.

Decision making environment

- Decision making under certainty
- Decision making under uncertainty

     i) criterion for optimism

     ii) criterion of pessimism

     iii) minimax regret criterion

     iv) Laplace criterion

Decision making under uncertainty

Criterion of Optimism or Maximax

1. Locate maximum payoff value for each alternative.
2. Select maximum of above maximum values and select corresponding alternative.

Criterion of Pessimism or Minimax or Maximin

1. Locate the minimum payoff in case of profit corresponding to each alternative.
2. Select the alternative which corresponding to maximum of minimum payoff

Mr. Sethi has Rs.10000/- to invest in one of three options A,B or C . The return on his investment depends on whether the economy experiences inflation, recession or no changes at all. His possible returns under each economic conditions are given below.

States of nature			
Strategy	Inflation	Recession	No change	
A	2000	1200	1500	2000
B	3000	800	1000	3000
C	2500	1000	1800	2500

Criterion of regret (savage criterion / minimax regret criterion)

From given payoff matrix develop a opportunity loss matrix

a)1 Find maximum payoff under a state of nature

2 subtract all payoff values under that state of nature from maximum payoff.

This difference is called as regret payoff.

b) For each alternative identify worst or maximum regret value.

c) Select the alternative which has smallest opportunity loss.(minimum regret value)

Opportunity loss table

Strategy	Inflation	Recession	No change	
A	1000	0	300	1000
B	0	400	800	800
C	500	200	0	500

Laplace criterion(Equally likely decision)

1.Assign equal probability to each state of nature i.e. 1/n

2. Compute expected payoff for each alternative by adding all payoffs and dividing by number of possible states of nature(n).

3. Select the best expected pay off value(maximum for profit , minimum for loss).

States of nature				
Strategy	Inflation	Recession	No change	Total
A	2000	1200	1500	4700(1566.67)
B	3000	800	1000	4800(1600)
C	2500	1000	1800	5300(1766.67)

Thank You