

Topic 3 Decision Analysis

1. Consider the following decision table.

		State of Nature		
		s_1 (0.4)	s_2 (0.35)	s_3 (0.25)
Decision Alternative	d_1	250	175	-25
	d_2	110	100	70
	d_3	390	140	-80

- Use the maximax criterion to determine which decision alternative to select.
- Use the maximin criterion to determine which decision alternative to select.
- Use the Hurwicz criterion to determine which decision alternative to select. Let $\alpha = 0.3$ and then let $\alpha = 0.8$ and compare the results.
- Compute an opportunity loss table from the data. Use this table and a minimax regret criterion to determine which decision alternative to select.
- Compute the *EMV* for each alternative and determine which alternative will be selected.
- Compute the expected monetary payoff with perfect information. Find also the value of perfect information.

2. Managers of a manufacturing firm decided to add Christmas tree ornaments to their list of production items. However, they have not decided how many to produce because they are uncertain about the level of demand. Shown here is a decision table that has been constructed to help the managers in their decision situation.

		State of Demand		
		Small	Moderate	Large
Decision Alternative (Produce)	Small Number	200	250	300
	Modest Number	100	300	600
	Large Number	-300	400	2000

- Use maximax and maximin criteria to evaluate the decision alternatives.
- Construct an opportunity loss table and use minimax regret to select a decision alternative.

3. A decision table from a business situation is shown below.

		State of Nature	
		s_1 (0.3)	s_2 (0.7)
Decision Alternative	d_1	350	-100
	d_2	-200	325

The decision maker has an opportunity to purchase sample information in the form of a forecast. With the sample information, the prior probabilities can be revised. When the state of nature is s_1 , the forecaster will predict s_1 90% of the time. When the state of nature is s_2 , the forecaster will predict s_2 75% of the time.

- Compute the expected monetary value of this decision without sample information.
- Compute the expected monetary value of this decision with sample information.
- Calculate the value of the sample information.

4. (a) A car rental agency faces the decision of buying a fleet of cars, all of which will be the same size. It can purchase a fleet of small cars, medium cars, or large cars. The smallest cars are the most fuel efficient and the largest cars are the greatest fuel users. One of the problems for the decision makers is that they do not know whether the price of fuel will increase or decrease in the near future. If the price increases, the small cars are likely to be most popular. If the price decreases, customers may demand the larger cars. Following is a decision table with these decision alternatives, the states of nature, the probabilities, and the payoffs. Use this information to determine the expected monetary value for this problem. Find also the value of perfect information.

		State of Nature	
		Fuel Decrease (0.6)	Fuel Increase (0.4)
Decision Alternative	Small Cars	-225	425
	Modest Cars	125	-150
	Large Cars	350	-400

- (b) The decision makers have an opportunity to purchase a forecast of the world oil markets that has some validity in predicting gasoline prices. The following table gives the probabilities of these forecasts being correct for various states of nature. Use this information to revise the prior probabilities and recompute the expected monetary value on the basis of sample information. What is the expected value of sample information for this problem? Should the agency decide to buy the forecast?

		State of Nature	
		Fuel Decrease	Fuel Increase
Forecast	Fuel Decrease	0.75	0.15
	Fuel Increase	0.25	0.85