

SOLUTIONS TO PROBLEMS

3-3. An alternative is a course of action over which we have complete control. A state of nature is an event or occurrence in which we have no control. An example of an alternative is deciding whether or not to take an umbrella to school or work on a particular day. An example of a state of nature is whether or not it will rain on a particular day.

3-4. The basic differences between decision-making models under certainty, risk, and uncertainty depend on the amount of chance or risk that is involved in the decision. A decision-making model under certainty assumes that we know with complete confidence the future outcomes. Decision-making-under-risk models assume that we do not know the outcomes for a particular decision but that we do know the probability of occurrence of those outcomes. With decision making under uncertainty, it is assumed that we do not know the outcomes that will occur, and furthermore, we do not know the probabilities that these outcomes will occur.

3-6. For a given state of nature, opportunity loss is the difference between the payoff for a decision and the best possible payoff for that state of nature. It indicates how much better the payoff could have been for that state of nature. The minimax regret and the minimum expected opportunity loss are the criteria used with this.

3-16. A risk seeker is a decision maker who enjoys and seeks out risk. A risk avoider is a decision maker who avoids risk even if the potential economic payoff is higher. The utility curve for a risk seeker increases at an increasing rate. The utility curve for a risk avoider increases at a decreasing rate.

- 3-17.** a. Decision making under uncertainty.
 b. Maximax criterion.
 c. Sub 100 because the maximum payoff for this is \$300,000.

Equipment	Favorable	Unfavorable	Row	Row
			Maximum	Minimum
Sub 100	300,000	-200,000	300,000	-200,000
Oiler J	250,000	-100,000	250,000	-100,000
Texan	75,000	-18,000	75,000	-18,000

3-18. Using the maximin criterion, the best alternative is the Texan (see table above) because the worst payoff for this (\$-18,000) is better than the worst payoffs for the other decisions.

- 3-20.** a. The expected value (EV) is computed for each alternative.

$$EV(\text{stock market}) = 0.5(80,000) + 0.5(-20,000) = 30,000$$

$$EV(\text{Bonds}) = 0.5(30,000) + 0.5(20,000) = 25,000$$

$$EV(\text{CDs}) = 0.5(23,000) + 0.5(23,000) = 23,000$$

Therefore, he should invest in the stock market.

$$\begin{aligned} \text{b. EVPI} &= \text{EV}(\text{with perfect information}) - (\text{Maximum EV without PI}) \\ &= [0.5(80,000) + 0.5(23,000)] - 30,000 \\ &= 51,500 - 30,000 = 21,500 \end{aligned}$$

Thus, the most that should be paid is \$21,500.

3-21. The opportunity loss table is

Alternative	Good Economy	Poor Economy
Stock Market	0	43,000
Bonds	50,000	3,000
CDs	57,000	0

$$\text{EOL}(\text{Stock Market}) = 0.5(0) + 0.5(43,000) = 21,500^*$$

This minimizes EOL.

$$\text{EOL}(\text{Bonds}) = 0.5(50,000) + 0.5(3,000) = 26,500$$

$$\text{EOL}(\text{CDs}) = 0.5(57,000) + 0.5(0) = 28,500$$

3-25. a.

Stock (Cases)	Demand (Cases)	11	12	13	EMV
11		385	385	385	385
12		329	420	420	379.05
13		273	364	455	341.25
Probabilities		0.45	0.35	0.20	

b. Stock 11 cases.

c. If no loss is involved in excess stock, the recommended course of action is to stock 13 cases and to replenish stock to this level each week. This follows from the following decision table.

Stock (Cases)	Demand (Cases)	11	12	13	EMV
11		385	385	385	385
12		385	420	420	404.25
13		385	420	455	411.25

3-29. The costs in the table are in 1,000s.

Alternatives	Demand			Optimistic	Pessimistic	EMV
	Low	Medium	High	Best Cost (Lowest)	Worst Cost (Highest)	Expected Cost
Ardmore	85	110	150	85	150	125
Sweetwater	90	100	120	90	120	108
Lake Charles	110	120	130	110	130	123
Probability	0.2	0.3	0.5			

- Optimistic decision: Ardmore. This location has the best of the best costs (85).
- Pessimistic decision: Sweetwater. This location has the best of the worst costs (120).
- The opportunity loss (regret) table is found by finding the best (lowest) cost in each state of nature, and comparing the other costs to that one. The opportunity loss table is shown here.

Alternatives	Demand			Minimax Regret	
	Low	Medium	High	Maximum	EOL
Ardmore	0	10	30	30	18
Sweetwater	5	0	0	5	1
Lake Charles	25	20	10	25	16
Probability	0.2	0.3	0.5		

The minimax regret decision is to choose Sweetwater. It has a maximum regret of 5, which is lower than the other maximums.

d. The decision based on the lowest expected cost of operation (EMV) is to choose Sweetwater. This yields an expected cost of 108 as seen in the payoff table.

e. The value of a perfect forecast is given by the EVPI. First calculate the following;

$$EV \text{ with PI} = (85)0.2 + (100)0.3 + (120)0.5 = 107$$

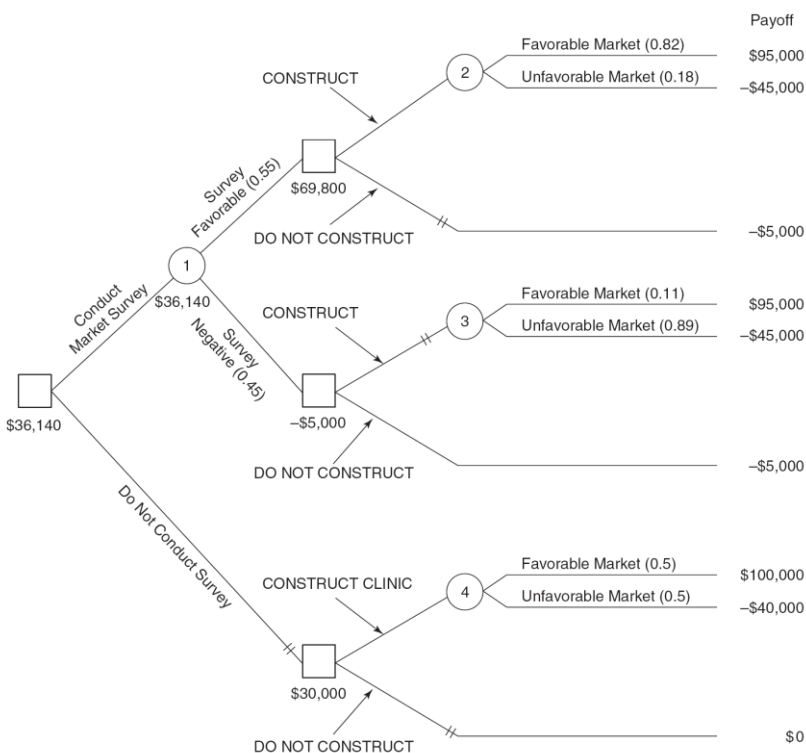
$$EVPI = (EV \text{ with PI}) - (\text{Best EMV without PI}) = 108 - 107 = 1$$

Thus, a perfect forecast is worth 1 (thousand).

f. The location that minimizes the EOL is Sweetwater.

g. The expected value of perfect information (EVPI) is 1. This is found in part e, and it is also the minimum EOL.

3-37. a.



$$\text{b. EMV}(\text{node 2}) = (0.82)(\$95,000) + (0.18)(-\$45,000)$$

$$= 77,900 - 8,100 = \$69,800$$

$$\text{EMV}(\text{node 3}) = (0.11)(\$95,000) + (0.89)(-\$45,000)$$

$$= 10,450 - \$40,050 = -\$29,600$$

$$\text{EMV}(\text{node 4}) = \$30,000$$

$$\text{EMV}(\text{node 1}) = (0.55)(\$69,800) + (0.45)(-\$5,000)$$

$$= 38,390 - 2,250 = \$36,140$$

The EMV for using the survey = \$36,140.

$$\text{EMV}(\text{no survey}) = (0.5)(\$100,000) + (0.5)(-\$40,000)$$

$$= \$30,000$$

The survey should be used.

$$\text{c. EVSI} = (\$36,140 + \$5,000) - \$30,000 = \$11,140.$$

Thus, the physicians would pay up to \$11,140 for the survey.