

8. Bob Farrell, owner of Farrell Motors, is trying to decide whether to buy an insurance policy to cover hail damage on his inventory of more than 200 cars and trucks. Thunderstorms occur frequently and they sometimes produce hail the size of golf balls that can severely damage automobiles. Bob estimates the potential damage from hail in the next year as:

Hail Damage (in \$1000s)	0	15	30	45	60	75	90	105
Probability	0.25	0.08	0.10	0.12	0.15	0.12	0.10	0.08

Bob is considering the following three alternatives for dealing with this risk:

- Bob can buy an insurance policy for \$47,000 that would cover 100% of any losses that occur.
 - Bob can buy an insurance policy for \$25,000 that would cover all losses in excess of \$35,000.
 - Bob can choose to self-insure, in which case he will not have to pay any insurance premium but will pay for any losses that occur.
- a. Construct a payoff matrix for this problem.
 - b. What decision should be made according to the maximax decision rule?
 - c. What decision should be made according to the maximin decision rule?
 - d. What decision should be made according to the minimax regret decision rule?
 - e. What decision should be made according to the EMV decision rule?
 - f. What decision should be made according to the EOL decision rule?
9. Morley Properties is planning to build a condominium development on St. Simons Island, Georgia. The company is trying to decide between building a small, medium, or large development. The payoffs received for each size of development will depend on the market demand for condominiums in the area, which could be low, medium, or high. The payoff matrix for this decision problem is:

Size of Development	Market Demand		
	Low	Medium	High
Small	400	400	400
Medium	200	500	500
Large	-400	300	800

(Payoffs in \$1000s)

The owner of the company estimates a 21.75% chance that market demand will be low, a 35.5% chance that it will be medium, and a 42.75% chance that it will be high.

- a. What decision should be made according to the maximax decision rule?
 - b. What decision should be made according to the maximin decision rule?
 - c. What decision should be made according to the minimax regret decision rule?
 - d. What decision should be made according to the EMV decision rule?
 - e. What decision should be made according to the EOL decision rule?
10. Refer to the previous question. Morley Properties can hire a consultant to predict the most likely level of demand for this project. This consultant has done many similar studies and has provided Morley Properties with the following joint probability table summarizing the accuracy of the results:

Forecasted Demand	Actual Demand		
	Low	Medium	High
Low	0.1600	0.0300	0.0100
Medium	0.0350	0.2800	0.0350
High	0.0225	0.0450	0.3825

The sum of the entries on the main diagonal of this table indicates that the consultant's forecast is correct about 82.25% of the time, overall.

- a. Construct the conditional probability table showing the probabilities of the various actual demands given each of the forecasted demands.
- b. What is the EMV of the optimal decision without the consultant's assistance?
- c. Construct a decision tree Morley Properties would use to analyze the decision problem if the consultant is hired at a cost of \$0.
- d. What is the EMV of the optimal decision with the consultant's free assistance?
- e. What is the maximum price Morley Properties should be willing to pay the consultant?

11. Refer to question 9. Suppose that the utility function for the owner of Morley Properties can be approximated by the exponential utility function:

$$U(x) = 1 - e^{-x/R}$$

where the risk tolerance value $R = 100$ (in \$1000s).

- a. Convert the payoff matrix to utility values.
 - b. What decision provides the owner of the company with the largest expected utility?
12. Refer to question 10. Suppose that the consultant's fee is \$5,000, and the utility function for the owner of Morley Properties can be approximated by the exponential utility function:

$$U(x) = 1 - e^{-x/R}$$

where the risk tolerance value $R = 100$ (in \$1000s).

- a. What expected level of utility is realized if Morley Properties hires the consultant?
 - b. What expected level of utility is realized if Morley Properties does not hire the consultant?
 - c. Based on this analysis, should Morley Properties hire the consultant?
13. The Tall Oaks Wood Products Company is considering purchasing timberland for \$5 million that would provide a future source of timber supply for the company's operations over the next 10 years. Alternatively, for \$5 million, the company could also buy timber as needed on the open market. The future cash flows from using the timber are estimated to have a present value of \$6 million regardless of whether the company buys the timberland today or waits to purchase its timber as needed over the next 10 years. This means there is a \$1 million net present value (NPV) of either buying the timberland now or buying the timber as needed. In other words, from a financial standpoint, the two alternative timber acquisition strategies would be equal. Now, suppose that the company believes there is only a 60% chance that the environmental regulations affecting timber supply will remain unchanged. Furthermore, the company believes that there is a 30% chance these regulations will become stricter during the next 10 years and only a 10% chance that these regulations will be relaxed. A reduction in timber supply should cause an increase in both the present value of future cash flows from using the timber due to higher sales prices and an increase in the present value of the cost of purchasing the timber as needed. (Of course, the change in selling price and buying cost may not be equal.) Should regulations become stricter, the company believes the NPV from buying the timberland now would increase to \$1.50 million while an NPV of buying the timber as needed would decrease to -\$0.50 million. Increases in the timber supply should have the opposite effects. Thus, should regulations become less strict, the company believes the NPV from buying the timberland now would decrease to -\$0.5 million while an NPV of buying the timber as needed would increase to \$1.50 million.