OPRE 6398.001 Prescriptive Analytics
Homework 10

Due 04/19/17
(11:30 a.m.)

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Note: 1. Your homework submission must be typewritten.

2. be sure to show detail calculations to earn full credit.

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1. Read Readings 13 and 14.

2. John Smith has been in business in Walla Walla, California, for the past several years. As the mayor's son-in-law, he sells used road machinery and paving equipment, which he buys at very good prices from a city agency. The mayor has received some uncomplimentary publicity and his chances of being reelected are relatively slim. As a result, John is considering selling half or all of his business to a potential buyer. A matter of risk pertains to how likely his father-in-law will win in the upcoming mayoral race.

   John estimates that if he sells half of his business and his father-in-law is reelected, a payoff of $720,000 can be expected. Should his-father-in-law be defeated, the payoff will be $105,000. On the other hand, John will receive a payoff of $390,000 regardless of the election if he sells the entire business.

   (1) Draw up a payoff matrix for the decision problem facing John.

   (2) If John has no idea about the odds that his father-in-law will be elected, determine the action that he should take based on each of the following criteria: (a) maximin, (b) maximax, and (c) minimax regret.

   (3) Suppose that John puts the likelihood at 50% that his father-in-law will win. Which action should he take based on each of the following criteria: (a) MO, (b) EV, and (c) ER?

   (4) Mary King is a well-known pollster in the Walla Walla area and he has recently conducted a poll on the upcoming mayoral election. She approaches John and offers her findings for $160,000. Assuming that the poll result is error-free in that it will correctly predict whether the incumbent mayor will win or lose. Should John accept the offer? Why or why not?

3. The objective of the National Hurricane Modification Program (NHMP) is to determine whether any hurricane threatening the U.S. coast should be seeded with silver iodide crystals in an attempt to mitigate its destructive effect. To achieve this goal, probability estimates are obtained about the likely impact of seeding a hurricane on the maximum sustained surface wind speed. A predictive model is then developed to determine the property damages (in millions of dollars) resulting from the various changes in wind speed.

   The information below was just collected on Hurricane Irene heading for the East Coast. Note that the seeding will change only the probabilities of various changes in wind speed and the property damage will be determined solely by changes in wind speed. Place yourself in the position of the NHMP director. If the cost of seeding the hurricane is $7,500,000, develop a decision tree and analyze it to determine if Irene should be seeded. What is the expected damage resulting from the optimal strategy? Be sure to include a copy of the computer printout.

Change in wind speed	Property damage	Probability (not seeded)	Probability (Seeded)
+30%	336	0.04	0.05
+15%	191	0.22	0.13
0%	100	0.48	0.37
-15%	47	0.17	0.29
-30%	16	0.09	0.16

4. Mary Koontz has to decide what to do about an apartment building she inherited from her great aunt in Walla Walla, Oregon. She can sell the building today (i.e., beginning of year 1), at the beginning of year 2, or at the beginning of year 3. She has decided not to keep it for more than two years.

   If Mary were to sell the building today, she could get $204,000. If she keeps it, she will receive a net income of $12,000 from rent each year. Mary estimates that, during year 1, there is a 25% chance that the value of the building will increase and a 75% chance of decreasing. If the value increases in the first year, then there is a 70% chance that it will increase again in the second year. If the value decreases during the first year, however, the value will also decrease in the second year with a probability of 0.9. Moreover, the value of the building will change (either increase or decrease) by $20,000 in each of the coming two years.

   As a first-cut analysis, Mary decides to ignore operating cost, discounting, taxes, and other complications. develop a decision tree and analyze it to determine what Mary should do. What is her maximum expected payoff resulting from the optimal strategy? Be sure to include a copy of the computer printout. (Hint: This is similar to the problem in Example 14.8.)

5. The president of Ponderosa Record Company has just signed a contract with a four-person rock group called the Fluid Mechanics. A tape has been cut, and Ponderosa must make an initial decision on whether or not to conduct a test marketing program in the local region, which will cost the company $240,000. If the record is test marketed, the president may decide to promote it nationally or abandon it regardless of the results. If there is no test marketing, however, then the company needs to decide whether to enter the national market or not.

   With no test marketing, the chance of a national success is estimated at 50%. If the test marketing is conducted, the respective probabilities for a favorable result and for an unfavorable outcome are judged to be 0.7 and 0.3. The conditional probability for a national success given a favorable test marketing is 0.85; for a national success given unfavorable results, it is 0.21.

   A national success will increase Ponderosa's total profit by $1,200,000, whereas a failure will reduce the company's profit by $800,000. Moreover, aborting the record will have no financial impact on the firm at all. Based upon the information provided, develop a decision tree and analyze it to determine Ponderosa’s optimal action(s) and the resulting maximum expected profit. Be sure to include a copy of the computer printout. (Hint: This is similar to the problem in Example 14.10.)