

Problem Set 4

Problem 1 - Insurance Coverage

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 golf ball sized hail that can damage automobiles. Bob estimates the potential damage from hail in the next year as:

Hail damage (in \$1,000s)	0	15	30	45	60	75	90	105
Probability	.25	.08	.10	.12	.15	.12	.10	.08

Bob is considering three alternatives for dealing with this risk:

- buying an insurance policy for \$47,000 that would cover 100% of any losses that occur;
- buying an insurance policy for \$22,000 that would cover all losses in excess of \$35,000;
- self-insuring, in which case he will not have to pay any insurance premium but will pay for any losses that occur.

Build a decision tree model to analyze this problem and determine the best expected value decision.

Problem 2 - Option Value

Refer to the 'Magnolia Inns' example developed in the TreePlan tutorial. Suppose Magnolia Inns could buy a one-year option on parcels at both locations. This option would give the hotel chain the right to purchase the land *next year* (that is, after the new airport location is known) at *today's* prices. Add a branch to the decision tree to represent this option. What is the most Magnolia Inns would be willing to pay for this option?

Problem 3 - Contract Bid

HydrauSpec has the opportunity to bid on a government contract for 100,000 high-pressure valves to be used in the hydraulic systems of aircraft. They estimate that these valves could be manufactured by their existing equipment at a cost of £12 per unit. However, one of their engineers has suggested a new process for manufacturing the valves. The unit cost for the new process will be £8 if all goes well. If complications arise however, the cost would be prohibitive, so they would have to return to the old process. The engineers estimate the probability of no complications at 0.6 and the probability of complications at 0.4. The investment required for the new process is £100,000, which would not be recoverable.

The company must make its bid on the contract before the new process can be fully developed and tested. Bids of £16 and £14 are under consideration and the estimated probabilities of obtaining the contract with each bid are 0.5 and 0.7 respectively. If HydrauSpec's bid is rejected, there is no possibility of submitting a second bid.

Construct a model to help HydrauSpec determine an optimal bidding and production strategy.

Problem 4 - Credit Granting Policy

Fred Piesley, newly appointed treasurer of Scientific Instruments (SI), was reviewing the company's credit policy. He became concerned because he found that the credit terms and risks tended to vary among the various divisions of SI. These variations were in part due to the credit managers acting in inconsistent ways. Piesley's goal with respect to credit policy was to get all credit managers to act in a consistent manner that would maximize profits for the overall company.

As a beginning, he decided to concentrate on the Scale division. The Scale division manufactured a high-accuracy, low-oscillating scale. In general, customers who bought these units rarely required replacement; the business was essentially of a no-repeat variety.

The credit manager of the Scale division, Al Sula, explained his current policy as follows. Anytime we get a request for credit we first check the customer's credit rating. On the basis of the rating we classify customers into three groups: (1) Excellent, (2) Probably Good, (3) Marginal. In the past, we have extended credit to all "excellent" and "probably good" accounts and rejected the requests of "marginal" accounts. However, we may want to begin extending credit to "marginal" customers. There are two ways we can do this: (a) extend credit to all "marginal" applicants, or (b) obtain a special credit report (costing about 300 F) for each marginal customer, and then make the decision based on this supplementary information. The special supplementary credit reports would permit classification of marginal customers into four subgroups, A, B, C and D. In Sula's estimation, 25% of applications would fall in the A group, 30% in B, 20% in C and 25% in D. Based on experience in other divisions, Sula had compiled data indicating frequencies of default for the various subgroups. For subgroup A, the probability of default was 0.1; for B it was 0.2; for C, 0.3; and for D, 0.6.

The price of the scale was 8000 F. Variable costs pertaining to each scale consisted of 3200 F manufacturing costs and 1800 F selling and other expenses. Prior experience showed that, on credit accounts in default, in 20% of the cases the company could expect to recover about 2000 F (of the 8000 F billed). In 30% of the cases in which credit was not granted, the customers bought the scale anyway on a C.O.D. basis.

- a) Set up a TreePlan model to evaluate SI's optimal credit policy.
- b) What is the value of the information provided by the special credit report?

Problem 5 - Marketing Strategy

The management of a motion picture studio has determined the following payoff table for marketing choices for a new film (the amounts are in millions of dollars):

Box Office Result	Distribute as 'A' Feature	Distribute as 'B' Feature	Sell to TV network
Success	5	3	1
Failure	-2	-1	1

The prior probability of a box office success has been judged at 30%. The studio is considering a series of sneak previews before deciding how to market the new film. Historically, it has been found that favorable previews have been obtained for 70% of all successful films previewed, while unfavorable previews have resulted from 80% of the box office failures subjected to such experimentation.

- a) Build a decision tree model to analyze this problem.
- b) What probabilities should be assigned to box office success, if the sneak preview is favorable?
If the sneak preview is unfavorable?
- c) If a sneak preview results in a net cost of \$100,000, would you recommend it be taken?
(Assume that choices are based on expected values.)