

Homework 3.3
6 points. End term: 12-th week (17-23 december)

Solve two of the following four problems.

1. Suppose you are going skiing this weekend for the first time. However, you are worried about the possibility of heavy snow storm during your first time out. Your alternative is to go to fishing in Canada. After thinking about the possibilities, you have decided that you value a weekend of skiing with no storm at \$400 and that you value a snow storm at $-\$1,000$. Going to fishing instead is worth \$300 to you. Finally, after talking to other people, you peg the chance of a blizzard at 3 in 10.

- (a) According to the three criteria, which alternative should you choose?
- (b) Find the critical points for the given pair of alternatives and indicate the better alternative for the corresponding intervals.
- (c) Find EVPI.
- (d) For an additional sum of \$50 a (friend) meteorologist can sell to you a very accurate weather report. Given your answer to (c), might it be worthwhile to buy this report?

But this expensive report may not be so accurate it pretends to be: usually the true weather was stormy, the report announced a storm with probability 0.6, and when the true weather was sunny, the report announced good weather with probability 0.8.

- (e) Construct the decision tree for this problem by hand.
- (f) Analyze the decision tree to identify the optimal policy.

2. We have two biased coins with probabilities of landing heads of 0.8 and 0.4, respectively. One coin is chosen at random (each with probability 0.5) to be tossed twice. You are to receive \$100 if you correctly predict how many heads will occur in two tosses.

- (a) According to the three criteria, what is the optimal prediction?
- (b) Find the critical point for the two alternatives.

Suppose now that you may observe a practice toss of the chosen coin before predicting.

- (c) Find EVPI. What is the most that you should consider paying to observe the practice toss?
- (d) Find EVE for observing the practice toss. If you must pay \$30 to observe the practice toss, what is your optimal policy?

3. The EE.ONE Power Company is planning to submit a major rate increase request to the National Power Commission. The Commission has assured EE.ONE that it would approve a request for a moderate rate increase. With this moderate rate increase, EE.ONE €40 million in additional revenues during the next two years (relative to no rate increase). However the company is considering a riskier course of action - requesting a high rate increase that would yield a €100 million in additional revenues, if approved. If the high rate increase is not approved, there is still some chance the Commission would grant EE.ONE a low rate increase, which would mean €20

million in additional revenues. Of course, the possibility exists that the Commission would simply refuse any rate increase whatsoever if EE.ONE asks for the high rate increase.

The best information within the company indicates a 70% probability the Commission would disapprove the high rate increase request. Given that it does so, the chance it would then grant a low rate increase is believed to be 60%.

- (a) Describe the decision system by defining the appropriate alternatives and states of nature, and by indicating the profits and the corresponding probabilities.
- (b) According to the three criteria, which alternative EE.ONE should choose?
- (d) Find EVPI.
- (e) For an additional sum of €5 a lobbyist company can give predict an accurate answer from the Commission regarding the high rate increase request. Given your answer to (c), might it be worthwhile to pay such a lobbyist company?

But this expensive finding may not be so accurate it pretends to be: usually when the Commission disapprove such a request the lobbyist reports that the Commission would disapprove the request with probability 0.5, and if it the Commission accept the request then the lobbyist reports that the Commission would accepted it with probability 0.8.

- (d) Find EVE and decide based on its value if it is worths to pay the lobbyist.
- (f) Construct the decision tree for this problem by hand.
- (g) Analyze the decision tree to identify the optimal policy.

4. The comptroller of the Macrosoft Corporation has \$100 million of excess funds to invest. She has been instructed to invest the entire amount for 1 year in either stocks or bonds (but not both) and then to reinvest the entire fund in either stocks or bonds (but not both) for 1 year more. The objective is to maximize the expected monetary value of the fund at the end of the second year.

The annual rates of return on these investments depend on the economic environment, as shown in the following table:

	Rate of Return	
	Stocks	Bonds
Growth	20%	5%
Recession	−10%	10%
Depression	−50%	20%

The probabilities of growth, recession, and depression for the first year are 0.7, 0.3, and 0, respectively. If growth occurs in the first year, these probabilities remain the same for the second year. However, if a recession occurs in the first year, these probabilities change to 0.2, 0.7, and 0.1, respectively, for the second year.

- (a) Construct the decision tree for this problem by hand.
- (b) Analyze the decision tree to identify the optimal policy.