Homework Assignment 8

Group homework (up to four members per group)
due in class on Thursday, 04/24/2014

STA 371G, Statistics and Modeling, Spring 2014

Problem 1: Freemark Abbey Winery (I) (15 points)

This problem is based on the Freemark Abbey Winery case. Please read this case carefully before answering the following questions. You should assume that Freemark Abbey Winery sells the wine in bulk ($1 per bottle) if the storm hits and there is no mold.

(a) Fill the payoff table below using the information given in the case. Find the optimal action with the *maximin* rule, the optimal action with the *maximax* rule.

Table 1: Payoff Table

	Storm Botrytis	Storm No Botrytis	No Storm Sugar 25%	No Storm Sugre 20%	No Storm Acidity <0.7%
Harvest Now					
Harvest Later					

(b) Create a loss table and find the optimal action with the *minimax loss* criterion.

(c) Construct a decision tree using the information given in the case.

(d) What is the probability distribution that represents the uncertainty regarding the possible outcomes if Jaeger decides to wait to see if the storm hits (rather than harvest immediately)? What is the mean of this distribution?

(e) What decision would you recommend to Jaeger given the information you have?

(f) Would your decision change if the probability changes from 0.4 to 0.2 that the botrytis mold forms given that the storm hits? Why or why not?

(g) Suppose Jaeger's utility function for x thousand dollars is

$$U(x) = 1 - e^{-\frac{x}{100}}.$$

Find the optimal action in terms of expected utility.

Problem 2: Freemark Abbey Winery (II) (15 points)

In this problem, we will study the value of information for Jaeger.

(a) Find the expected value of perfect information (EVPI). This would be the maximum amount of money you would be willing to pay for perfect information.

(b) Suppose you could buy perfect information regarding whether or not the storm will hit. What is the most you would be willing to pay for this information?

(c) Suppose you could buy perfect information regarding whether or not the botrytis mold forms if the storm hits. What is the most you would be willing to pay for this information?

Problem 3: Freemark Abbey Winery (III) (15 points)

In this problem, we will apply the Bayes' theorem to find out the value of sample information. In problem #2, you computed the expected value of the mold expert's perfect information regarding whether or not the condition of the grapes is such that the botrytis mold will form if the storm hits. Now suppose the information is not perfect. In particular, suppose that if the condition of the grapes is such that the mold will form if the storm hits, the mold expert correctly indicates this 75% of the time; and if the condition of the grapes is such that mold will not form if the storm hits, the mold expert correctly indicates this 85% of the time.

(a) Fill the joint probability table shown below:

	Mold	No Mold	
Expert States Mold			
Expert States No Mold			

(b) If the mold expert states that the mold will form if the storm hits, find the optimal action and the expected payoff under that action.

(c) If the mold expert states that the mold will not form if the storm hits, find the optimal action and the expected payoff under that action.

(d) How much are you willing to pay for the mold expert's imperfect information?