INTERNATIONAL UNIVERSITY OF JAPAN
Public Management and Policy Analysis Program
Graduate School of International Relations

DCC5350 (2 Credits)
Public Policy Modeling
Spring 2017

Homework 2: Decision Analysis (100 points)

Instruction: Write down your student ID and name at the top of your answer. PLEASE handwrite. Organize your answer in the ascending order (1, 2, …) and use single column. Show your calculation clearly; otherwise, you may not get the full credits. You may not communicate (including written, verbal, gestural, any other communication) with others except for the instructor and TAs to do this homework. Submit your answer to TA at the start of the class on Wednesday, April 19th.

Question: Read Question 9.9 on page 371 very carefully and then answer following questions. Caution: "Make a decision" means that you must explicitly mention your decision. Calculation itself is not a decision. You should say, for instance, "So, Dwight will grow crop 1" rather then "Dwight will choose the first alternative" or "He will choose the best one."

Question 1. Identify a decision variable and the payoff table (15 points).

1.1 (10 points) Solve the question *a*. Construct a payoff table from the table given (Please pay special attention to the labels on the table and feel free to adjust the scale).
1.2 (5 points) Solve the question *b*. Ignore Bayes' decision rule and only draw a decision tree. Don't forget to add (prior) probabilities to the decision tree.

Question 2. Decision-making under uncertainty (Assume no probability) (20 points).

2.1 (5 points) Make a decision using the Hurwicz criterion with alpha = .1.
2.2 (5 points) Make a decision using the MaxiMin criterion.
2.3 (10 points) Make a decision using the Savage (MiniMax) criterion. Report the regret table first.

Question 3. Decision-making under risk (10 points).

3.1 (5 points) Make a decision using EMV.
3.2 (5 points) Make a decision using EOL. Do not repeat the regret table.

Question 4. Expected value of perfect information (10 points). Suppose you have perfect information about the weather.

4.1 (5 points) Report the expected monetary value **with** (under) this perfect information, not EVPI.
4.2 (5 points) Draw the decision tree under the perfect information. Be careful when determining squares and circles.

Question 5. Expected value of imperfect information (45 points). Suppose a vendor invents a weather forecasting device, "WeatherTeller," that looks like a typical GPS handheld set. WeatherTeller produces green or red signal depending on barometric condition. If it will be really dry, WeatherTeller will have 5 percent of chance to show green and 95 percent for red; P(Green|Dry)=.05 and P(Red|Dry)=.95. In case of moderate, there are 70 percent of chance that WeatherTeller shows green and 30 percent for red. Finally, if the area is really damp, WeatherTeller always shows green (100%). The market price of WeatherTeller turns out $1,000.

   5.1 (5 points) Calculate six *joint probabilities*. Begin with P(Green & Dry).
   5.2 (5 points) Calculate (*unconditional) marginal probabilities*, such as P(Green)
   5.3 (5 points) Calculate six *posterior probabilities*. Begin with P(Dry|Green).
   5.4 (10 point) Calculate expected monetary values of eight cases. Begin with the expected value of growing crop 1 when WeatherTeller gives you green signal: EMV(Crop1|Green).
   5.5 (5 points) Calculate the expected value **with** this imperfect information, not EVII.
   5.6 (10 points) Draw a decision tree under this imperfect information. Don't forget to add expected values, probabilities, and payoffs. This decision tree should be large enough.
   5.7 (5 points) Do you think Dwight will purchase WeatherTeller? Why and why not?

Bonus (10 points). Suppose you don't know EVII that you calculate in Question 5 (or you finish Questions 1-4 only). If WeatherTeller becomes expensive and its price reaches $2,000 per each, what would you, as a professional policy analyst, advise Dwight? Tell me your reasoning. * Note that this question is not mandatory but optional!

End of homework assignment 2.