Business Decision Analytics under Uncertainty
Spring 2018, Professor Eckstein
Homework 1

Due Wednesday, January 31

Q1: Game Show

You are a contestant a game show with the following rules: there are four cards face down on the table. The cards are marked "low", "medium", "high", and "stop" and are shuffled in a random order. You draw these cards one-by-one, and have the option to quit the game before drawing each card. If you draw the "stop" card, you are immediately dismissed from the game with zero winnings. If you quit the game or run out of cards, your winnings correspond to the last card you drew: $100,000 for "low", $200,000 for "medium", and $300,000 for "high".

Analyze this game with a decision tree, showing your work. What is the optimal policy for playing the game, and what is its EMV? To simplify your tree, you may assume whenever you draw the "high" card, you will immediately quit, as it obviously can only hurt you to continue.

Q2: Television Shows

Problem 4 on page 72 of the textbook. Show your work, including a completed decision tree. State the optimal policy and its EMV. Calculate the EVSI and EVPI, showing your work.

Q3: Renovating an Historic House

You have just bought a run-down house in a historic presentation district for $220,000. You plan to renovate it, after which you believe you can sell it for $450,000. There are two different ways you can perform the renovation, "Plan A" and "Plan B". Plan A would cost $125,000 and take three months. Plan B would cost $85,000 and take four months; however, Plan B requires approval by the historic preservation board. It will take the board two months to consider the proposal for Plan B and you believe the chance of the proposal being approved are 70%. Each month you hold the property costs you $1,500 in financing costs and property taxes. You are considering three options:

- Pursue plan A immediately
- Submit plan B for approval to the preservation board and wait for their decision. If they approve plan B, pursue plan B; otherwise pursue plan A.
- Submit plan B for approval but start work on it immediately. If the plan is not approved, you will have to "backtrack" after two months and pursue plan A instead. This will result in a total construction costs of $145,000 and a total construction time of 5 months.

Assuming that you are using the EMV criterion to make your decisions, which option should you pursue? What is its EMV? Use a decision tree and show your work.