MISM 95-760: Decision Making Under Uncertainty

Homework 4

Submit your work electronically on blackboard by the posted due date. Submit a single PDF. Include all necessary screenshots and documentation for the graders to understand your answer. Include your name on the PDF.

1. Ragsdale 6th edition, Chap 12, problem 15, parts (a)-(c) as listed BELOW: “The Harriet Hotel in downtown Boston has 100 rooms…”

(a) Create a spreadsheet implementation for this problem

(b) How many reservations should the hotel accept if it wants to maximize the average daily profit?

(c) What is the average daily profit under the number of reservations from part (b)? Use a 95% confidence interval to put error bars on your estimate.

CLARIFICATIONS: you should assume the following:

1. the demand for reservations is high enough that the hotel is able to accept up to the maximum number of allowed reservations.
2. Guests pay rent when they make the reservation, and forfeit their payment if they do not show up
3. The $200 overbook fee includes refunding the rent (so really it is just a $50 payment to the disgruntled customer)
4. For part (b), just try the values 100, 105, 110, 115, and report **all** choices which might maximize the average daily profit, given your 95% confidence error bars on all estimates.
5. Ragsdale 6th edition, Chap 12, problem 6., parts (a)-(b).”Suppose a product must go through an assembly line made up for five sequential operations. The time it takes to complete each operation is normally distrubted with a mean of 180 seconds and standard deviation of 5 seconds. Let X denote the cycle time…”

HINT: the cycle time is the maximum allowable time for any single operation to finish.

CLARIFICATION: in part (b), account for the fact that your simulations are inexact by using a 95% confidence interval for the probability that all 5 operations finish under the cycle time. Choose X so that the 95% confidence interval for the probability of success excludes any probability less than 98%. When trying different values of X, you may choose values rounded to the nearest second (no fractional values of X need be tried).

1. In a group of people of a given age (for example, age 65), some proportion of those people will not live another year. Let *qx* represent the proportional of people of age *x* who will die  before reaching age *x* + 1. The value *qx* is sometimes called the mortality rate at age *x*. The following formula is sometimes used to model mortality rates:

*qx* = 1 – EXP((LN(1 – *qx-1*))2 / LN(1 – *qx-2*) )

Mortality rates plan an important role in numerous planning and retirement decisions.

Assume that the mortality rates for males at age 63 and 64 are *q63* = 0.0235 and *q64* = 0.0262. Answer questions (a)-(c):

1. On average, to what age should a 65 year old male expect to live?
2. What is the probability of a 65 year old male living to at least age 80?
3. What is the probability of a 65 year old male living to exactly age 80?

CLARIFICATION: In your spreadsheet, only simulate up to age 100.

**Note:** You may either find exact answers to both problems 2a and 3(a-c) using mathematics, or find near- exact answers using simulation. Either approach is fine, choose whichever you want. Suggestion: try using simulation to practice the unit material! The final exam question will be written in such a way so that simulation will be necessary