Homework 2: Spreadsheet Analysis
IDS.332 and IDS.333

Due Dates:

- **Monday**, **Sept. 27**: Submit a **Draft** of assignment **with your questions and issues. Your drafts provide us with basis for coaching and answering questions.** The instructors will review your drafts and shape the in-class discussion on Tuesday the 28th to address your issues. Draft is not graded.
- **Tuesday, Oct 5**: Submit completed assignment.

Grading:

- **Draft:** Full "participation" marks for a serious effort on time; No points for no or late response.

- **Completed Assignment:** Each of 5 parts counts equally.

Concept of Assignment

The purpose of this assignment is to exercise and then validate your understanding of how to set up a spreadsheet for simulation of outcomes and evaluation of flexibility.

The prime learning objective is to develop your confidence in using the approach, at least in a simple situation. The project will also stimulate you think about alternative strategies over time – and to ask questions the class will address.

The exercise uses data personalized to you by modulating your birth date.

Assignment – similar to, but different from this assignment in earlier years

1. Details of the case:
    a. You are responsible for setting up plant capacity to produce "Mitexx", a fictitious new 'miracle textile' with wonderful properties.
    b. Your task is to identify the best way to establish production capacity over the next 5 years (that is, how much capacity to install for which year).
    c. Marketing studies forecast demand starting at 100 (Normalized volume, to keep proprietary information confidential), and growing linearly to a maximum in the 6th year = [100 x (Your Special Factor)].
    d. The Special Factor is a modulation of your birthdate. It uses the:
        i. Your Day Sum = day + month of your birth (range from 2 to 43)

      ii.   Your Year Sum = century and year number of your birth year (such as 19 + something like 90)   (range ~ 90 to 120) If born after 1999, use (100 + age). For 2002 => 100 + 19 = 119

      iii. Your Special Factor = [(Day Sum) +(Year Sum)] / 50 (range ~ 2.0 to 3.2)

e. You can select plant capacity in units of 60 (that is, 60, 120, 180, etc.)

f. You can build capacity in any year (for example, 120 each year; or 180 at start and 60 2 years later; etc.)

g. Once built, capacity lasts for the remainder of the project.

h. The cost of production capacity (plant size) for Mitexx exhibits reasonable economies of scale: Plant size cost = 3(Capacity)^{0.85}$ Note that:

      i. Formula applies only to plant size actually built in any year;

      ii. There are many exponent calculators on the web, such as http://keisan.casio.com/exec/system/1223447896 For example: 100exp0.8 = [10exp2]exp0.85 = 10exp1.7 = 50.1

      iii. You can program this into Excel as = 3*[reference cell with capacity value]^0.85

i. You build capacity in advance, that is, at Time=0 to supply for Year 1.

j. However, your annual cash flow (production costs and sales revenues) occur at the end of each year, after capacity is built. This is a common assumption.

k. The cost of material and labor for Mitexx equals $1 unit per unit produced.

l. A distributor will buy your product at a fixed price = $2 per unit. In effect, assume that distributor takes the risk of price competition.

m. The plant will only produce enough to match amount of demand in that year (No excess production saved over to next year.)

n. You cannot produce more than plant capacity in any year. If demand exceeds capacity, there's no penalty to you, but you miss out on sales.

o. As a responsible and thoughtful developer, you will recognize that demand forecasts are unreliable, and you account for that. For the purposes of this

analysis assume that actual demand in any year is defined by a uniform distribution that is +/- 20 % from forecast demand.

p. You must use an annual discount rate = 13%. This is a plausible value for analysis of a risky investment, assuming no inflation (as in this case).

2. The Assignment has 5 parts:

   a. Set up base case: Set up the spreadsheet for the deterministic case – no uncertainty in demand. Almost surely easiest to do this by adapting the "Garage Case Template", posted on Canvas.

   b. Base case analysis: Analyze the base case for the deterministic situation using a minimum of 3 alternative plans for the installation of plant capacity and recommend a plan. Do not attempt to exhaust the possibilities – it would be painful and would have minimal educational merit.

   c. Redo with uncertainty: Analyze the performance of your recommended solution (only the 'best' of your 3 plans) from part 2b when there is uncertainty in demand. Conduct Monte Carlo simulation (2000 iterations, as baked into the Garage template) and present the mean and the cumulative distribution function (CDF) for this solution. How does its performance compare with your response to preceding part 2b?

   d. Analysis with uncertainty: Having set up the uncertainty analysis, explore the situation and see if you can improve your plan from part 2b with alternative plans. Present the results, using text and Excel screenshots.

   e. Briefly discuss this exercise:

      a. What do you feel you learned?

      b. What questions do you have about concept of method?

Submit Assignment using Canvas

- Format should be Word with embedded Excel screenshots

- Your document must use footers with your name, assignment name, and pagination (as on this document). If not familiar with "footers" locate command under either "View" or "Insert" (depends on Word version and computer).

IDS.333 Risk and Decision Analysis
Fall 2021