EXERCISES IN BASIC MATHEMATICAL MODELING OF BUSINESS PROBLEMS

Homework Assignment 1

Due: Monday, 5 February 2014 (11:59 pm)

Submit: Give me a paper with your solutions on it during class on the specified day.

Submission format: This assignment in be done in Excel. Clearly mark which question you are answering. You will need to explain your work by typing in text fields. Don't just give a column of numbers. If you choose to type your answers, you can use MathType in MS Word. This is a good skill to have and I can show you how to do so. However, you are not required to type your answers. You may write them by hand in a neat, easy to read fashion.

Submission:

Submit a pdf into the Canvas system. If you have hand-written notes, you will need to scan them.

EXERCISES IN PARAMETER ANALYSIS

Refer to the notes. In particular, look at equation (1.3) and answer the following questions

$$P_t = g(t; P_0, m, j) = P_0\left(1 + \frac{j}{m}\right)^{mt}$$

1) Explain the parameters. What do they mean, what values they might take and so forth? Identify any required restrictions. (ie can interest be negative).

2) Suppose $1000 is deposited in an account that receives interest compounded monthly. Let the interest rate be 1.5 %. Calculate the amount in the account if it is compounded annually for 5 years.

3) Repeat the calculations above for different compounding periods. That is, calculate for five years the amount in the account for m = 2, 4, 6, 12. Discuss the impact of increasing m by using annual compounded as a base line.

4) Visualize these calculations by plotting them on the same graph.

5) Repeat the calculations above for different interest rates. That is, calculate for five years the amount in the account for j = 2.5%, 5%, 7.5%, 10%. Discuss the impact of increasing m by using annual compounded as a base line.

6) Visualize these calculations by plotting them on the same graph.

7) With all other things held constant, estimate the long term impact of changing the compounding period by $\Delta m > 0$. That is, compare $m' = m + \Delta m$ to m.

8) With all other things held constant, estimate the long term impact of changing the interest rate by $\Delta j > 0$. That is, compare $j' = j + \Delta j$ to j.

9) Now compare to the model for continuous interest given in equation (1.15).

$$S_t = g(t; S_0, r) = S_0 \exp(rt)$$

 What value for r will "yield" fives of 1000 dollars compounded monthly at 1.5%?

10) Derive a general formula for this yield equivalence.