OPTIMUM CAPACITY INCREMENT -- INTRODUCING FLEXIBILITY

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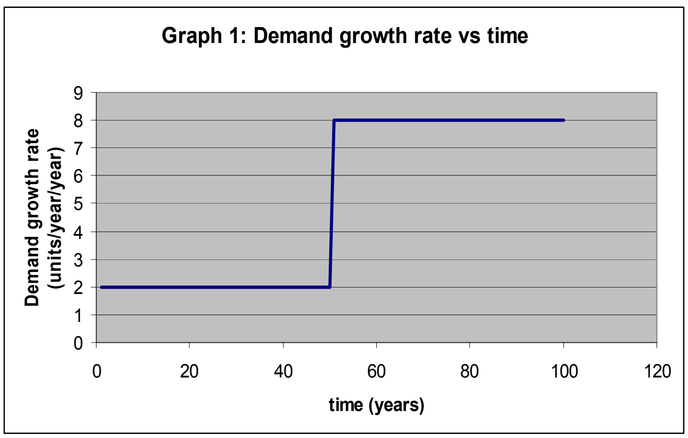
GOALS:

1. To introduce flexibility
2. To identify the consequences of adopting a fixed policy under changing demand

GENERAL PROBLEM DESCRIPTION:

This exercise assumes you have calculated the optimal cycle time and hence the optimal plant size under a constant linear demand growth and an exponential demand growth (Optimal increment for capacity expansion – base case and non-linear growth). In this exercise you will define optimal policy under a changing linear demand growth pattern. You are going to compare two different policies: a fixed plant size policy, and a changing one.

PROBLEM OUTLINE: You are given that the demand grows by 2 units/year/year for the first 50 years and by 8 units/year/year for the rest 50 years (see graph 1, bellow).



The average demand growth rate through the time horizon is 5 units/year/year. Hence your first policy is to use an optimal size as predicted from the base case model throughout the 100 years horizon. The second policy is to use two different plant sizes. The initial plant size will be the optimal size predicted by the base case model for the small demand growth (2 units/year/year) while the second plant size will be the optimal plant size predicted by the base case model for the high demand growth (8 units/year/year).

For this exercise you are given a new “flexible model” (Optimal Capacity Expansion –flexible.xls). In the inputs worksheet you have the same assumptions as in the base case model. In the flexible model worksheet you are given a modified base case model to allow you to enter any plant size you want at any time (this is done manually) to try different policies. Every policy that you try you have to make sure that the selected plant size is appropriate to meet the demand at any time.

Note: This means that you should check the model’s logic value to be “true” at all times. If it is not, you should adjust the addition of new capacity in line 37of the Spreadsheet.

ACTIONS:

1. In the flexible model worksheet enter the two growth rates (2 and 8) in the green cells.
All other inputs remain the same as in the base case model. According to the base case model, the optimal cycle time with linear growth is 7 years and for the average demand growth of 5 units

/ year /year the optimal plant size is 35 units/year. Hence enter this plant size value at the flexible model (cells: C37 to CY37) every 7 years. Run the model to find the NPV.

2. According to the base case model when demand grows by 2 units/year/year the optimal plant size is 14 units/year and when the demand grows by 8 units/year/year the optimal plant size is 56 units/year. So enter plant size 14 in cells C37 to AS37 and plant size 56 in cells AZ37 to CY37 again every 7 years. Run the model to find the new NPV.

3. Try any other growth pattern you like by changing values directly in the flexible model row 37 and compare a fixed policy based on average growth rates versus a flexible one.

DISCUSSION QUESTION:

1. What is the NPV for the fixed plant size policy and for the flexible plant size policy? What is the effect of a flexible policy?

TAKE AWAY:

1. When demand growth rate changes the flexibility to adapt to these changes and change your plant size accordingly can minimize the overall costs.