

14.20 – Spring 2003  
Professor N. L. Rose

Problem Set #1:  
Benchmark Exercise for Competitive Strategy Game

**DUE FRIDAY, FEBRUARY 21, 1 P.M.**  
(TURN IN AT RECITATION OR SUBMIT ELECTRONICALLY ON WEBSITE)

**LATE PROBLEM SETS WILL NOT BE ACCEPTED**

**BACKGROUND:** On the course web site you will find a spreadsheet, **CSGData.xls**, providing data on market prices and quantities for each of the four markets in the CSG. These data supplement the data provided in the CSG instructions. Most of these data involve a single supplier in the market reporting several realizations of price and quantity. (Demand is stochastic, so the quantity demanded at a given price will tend to vary from one realization to another.)

Parts 1-2 of this exercise ask you, for each of the four markets in the CSG, to calculate the profits that your firm (team) would make if it served that market as a monopolist. **To fully solve these problems you will need the CSG Market Profiles (Attachment A to the CSG Instructions), the CSGData.xls spreadsheet, and your team's cost data, which will be made available to your team via email.** You can complete problem 1, however, without your specific cost information. We recommend that you employ regression analysis to estimate expected demand at each price (quantity as the dependent variable, price as the independent variable), and then construct a spreadsheet to analyze the expected revenues and costs associated with different possible prices.

**NOTE: THIS ASSIGNMENT IS CONFIDENTIAL!**

You should not even mention this assignment to anyone who is not on your team. Information sharing beyond your team is a violation of anti-trust laws, and could result in fines to your firm. In addition, it violates the course expectations, and will be treated as if you were sharing information on an exam. It is your responsibility to safeguard your team's data and your assignment.

You should work together with your team to construct the spreadsheet and analyze the information. Each team member should get his/her own electronic copy of the spreadsheet and turn in an individual write-up. You should turn in both your team's spreadsheet and your individual write-up.

**Warning:** *Problems 1-4 ask what you would do in each of the four markets in the CSG if you did NOT face any competition. While these calculations should help you understand the cost and demand conditions in these markets, you would be unwise to ignore your rivals, both actual and potential, when devising your strategy.*

## 1: Monopoly calculations for market D

1.1. Estimating demand. Suppose that you are a monopolist considering entry into market D. Given the data provided, use Excel to estimate the market demand curve. Experiment with at least two functional forms for the demand curve. Plot the actual data against your estimates and explain which one gives you a better fit. Write down your estimate of the demand curve, and calculate the elasticity of demand at two or three different prices.

1.2. Short-run profit maximization. Suppose that capacity is free. Find the per-period profit-maximizing price for a monopolist in this market. To do this, create a table in Excel, where the first column has possible prices you might charge, in increments of 1. (Input the first value and then use the edit-fill-series command in Excel). In adjacent columns, calculate the market demand, the total revenue, the cost of production, and profits. Highlight the cell that indicates the profit-maximizing choice, and report your answer. Explain the logic of why your procedure gives you the optimal choice.

1.3. Profit-maximizing choice of capacity over 4 periods. Start by analyzing a single period. For each increment to the price, calculate the change in capacity required to meet demand at that price. Then, for each such capacity increment, calculate the incremental contribution to profit per unit of capacity. Finally, take the present discounted value of this over four periods. Now compare this to the economic cost of each unit of capacity. (Don't forget to take into account the scrap value.) What is the profit-maximizing choice of capacity? [RECALL: if the interest rate per period is  $r$ , then the present value of receiving  $\$x$  in  $t$  periods from now is  $x/(1+r)^t$ .]

## 2: Market Comparison: Monopoly calculations for markets A-D.

For each market A through D, make a table in Excel showing the cash flow for your firm in each of eight periods, given profit-maximizing choices and monopoly in each market. This should take into account your firm-specific costs and the 4-period maximum capacity life. If you could enter only one market, which one would you enter? What is the expected value of the firm given this strategy, and how does it compare to a no-entry strategy?

## 3: Market Entry: Comparing monopoly markets across A-D

Your firm may enter multiple markets, but can enter at most one market per period. If you expected to be a monopolist, which market would you enter first? Which market would you enter next? Would you enter any other markets? Explain your reasoning.

## 4: Differentiation

The data for market C in the spreadsheet includes observations with more than one firm in the market. These data can be used to analyze the effect on total sales in the market of increasing the number of firms in the market if the price in the market were held constant. Run a multiple regression with both price and number of firms on the right-hand side to estimate the “variety” effect, the effect on sales of having more firms in the market at a given price. How should this effect influence your views on competition in the market?

**5: Competition**

You will be facing other teams in the CSG. After the first rounds, what is the average number of firms you expect to find in each market? Based on what you have learned so far, which markets do you expect to attract the most entry? Why? You do not need to support this with new calculations, just provide a few sentences about each market explaining what might make entry more or less desirable.

**6: Comparative Advantage**

For each of the four markets, how likely do you think it is you will have the lowest marginal cost in the market? How likely that you will have the highest marginal cost? Explain.

**7: Entry Plans**

Taking into account everything you have learned so far about the markets and your relative positions, rank the markets in terms of the priority you have for entering them. Explain your logic.