ECON 110, Prof. Hogendorn

Problem Set 5

1. *Benetton*. Benetton has a stock market capitalization of $1.2 billion and trades at a price-earnings ratio of 6.5. Hennes & Mauritz, the parent of H&M, trades at a price-earnings ratio of 18.3.

   (a) What are Benetton’s yearly earnings? Does the stock market expect them to rise faster or slower than H&M’s?

   (b) Benetton’s costs as a percentage of sales are 54%, while H&M’s are 39%. Does this help to explain the difference in price-earnings ratios?

2. *Ford Toyota*. Let Ford and Toyota have two small factories, each with exactly the same production function for producing cars:

   \[ f(L) = 316L^{1/4} \]

   Each company makes a single type of car that sells for a price of \( p = $25,000 \). Each worker’s annual salary is $62,500. Each company makes 1000 cars per year at its factory.

   (a) What is the conditional factor demand for labor? What is the average variable cost and marginal cost of a car?

   (b) Toyota has a fixed cost of $15,000,000 at its factory. What is its operating profit and its net profit? Show the profits on a graph of price, average cost and average variable cost.

   (c) Ford has the same $15,000,000 fixed cost, plus additional fixed costs of $6,000,000 due to pensions for retired employees. What is its operating profit and its net profit? Show the profits on a graph of price, average cost, and average variable cost.
(d) Assume production is fixed at 1000 cars and does not change from year to year. Toyota’s factory will last for 5 years. Car prices and workers’ salaries are both projected to grow at 5% per year. The production function will not change, and the same $15 million fixed cost occurs every year. The factory will have no value at all after 5 years. If the interest rate is 10%, how much is the factory worth today?

3. **Low.** Suppose a firm has cost curves $MC(q) = 0.0512q$ and $AC(q) = \frac{50}{q} + 0.0256q$. Use the first derivative of $AC$ to prove that $MC$ crosses $AC$ at the lowest point on the $AC$ curve.

**Review Problems only, not to turn in:**

4. **NetAlone.** Suppose netalone.com is an Internet startup that specializes in e-business consulting. The following table summarizes the company’s projected earnings in the next 5 years:

<table>
<thead>
<tr>
<th>Year</th>
<th>Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>100,000</td>
</tr>
<tr>
<td>2010</td>
<td>300,000</td>
</tr>
<tr>
<td>2011</td>
<td>500,000</td>
</tr>
<tr>
<td>2012</td>
<td>700,000</td>
</tr>
<tr>
<td>2013</td>
<td>1,000,000</td>
</tr>
</tbody>
</table>

The CEO of netalone.com announced that the company was going to issue 10,000,000 shares of common stock and the IPO (initial public offering) price was set at $1 per share. (A share of stock entitles you to a share of ownership of the company, and the company’s value is based on its earnings.) Suppose the market discount rate is 10%. Based on the above earnings forecast, will you buy the stock? What do you think is a more reasonable price?

5. **Nineteen.** A firm’s production function is $q = f(L) = 10 + L^{1/3}$. The wage of labor is $10. The firm has a fixed cost of $47,500.
(a) What are this firm’s total, marginal, average, and average variable cost curves? (Hint: as a general rule, don’t expand expressions like \((a + b)^2\) unless you really have to!)

(b) Suppose the firm is a perfect competitor and the price of the good is $3,000. How much profit does the firm make? How much labor is employed?

(c) If the price fell by 19%, what would be the percentage change in profits and employment at this firm? Graph what happens in two ways: on a graph of the marginal and average cost curves and on a graph of the production function.

(d) After the price falls, should the firm shut down?

Answers to Review Problems:


(a) 
\[
PV = \frac{100000}{1.10} + \frac{300000}{1.10^2} + \frac{500000}{1.10^3} + \frac{700000}{1.10^4} + \frac{1000000}{1.10^5} = 1813531
\]

The present value of the earnings per share is thus $0.18. Paying $1 per share is too much unless there will be extremely spectacular growth after 2013. A price of $0.18 per share would be the fair value assuming that earnings beyond 2013 are not counted.


(a) Inverting the cost function gives \(L = (q - 10)^3\). Then the cost functions are:
\[
\begin{align*}
TC(q) &= 47500 + wL = 47500 + 10(q - 10)^3 \\
MC(q) &= 30(q - 10)^2 \\
AC(q) &= \frac{47500}{q} + 10 \frac{(q - 10)^3}{q} \\
AVC(q) &= 10 \frac{(q - 10)^3}{q}
\end{align*}
\]
(b) Write the profit function as $\pi(L)$ instead of $\pi(q)$:

$$\max_L \pi(L) = pq - TC(q) = 3000(10 + L^{1/3}) - 47500 - 10L$$

Then the first order condition is:

$$\frac{d\pi}{dL} = 1000L^{-2/3} - 10 = 0 \Rightarrow L = 1000$$

Profit is $\pi(1000) = 3000(10 + 10) - 47500 - 10000 = 2500$.

(c) The new first order condition would be

$$\frac{d\pi}{dL} = (1 - 0.19)1000L^{-2/3} - 10 = 0 \Rightarrow L = 729$$

The new profit is

$$\pi(729) = (1 - .19)3000(10 + 9) - 47500 - 7290 = -8620$$

Thus, employment falls by 27.1\% and profit falls by a whopping 445\%!

(d) The new quantity is $f(729) = 19$, and $AVC(19) = 10(9)^{1/3} = 383.7$. This is less than the new price of $(1 - 0.19)3000 = 2430$. The firm should not shut down because it more than covers its variable costs, and in fact makes quite a large contribution to fixed costs. In the long run, however, it should shut down.