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. *FordToyota.* 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:

Year	Earnings
2009	100,000
2010	300,000
2011	500,000
2012	700,000
2013	1,000,000

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 $(a+b)^c$ 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:

4. *NetAlone_a.*

(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.

5. *Nineteen_a.*

(a) Inverting the cost function gives $L = (q-10)^3$. Then the cost functions are:

$$\begin{aligned} TC(q) &= 47500 + wL = 47500 + 10(q-10)^3 \\ MC(q) &= 30(q-10)^2 \\ AC(q) &= \frac{47500}{q} + 10\frac{(q-10)^3}{q} \\ AVC(q) &= 10\frac{(q-10)^3}{q} \end{aligned}$$

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

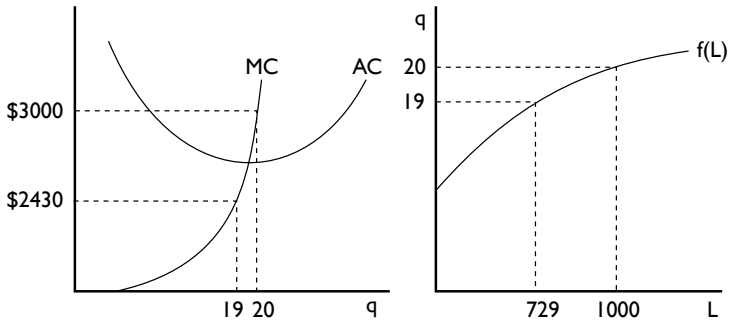
(c) The new first order condition would be

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

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 $AVC(19) = 10\frac{(9)^3}{19} = 383.7$. 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.