ECON 110, Professor Hogendorn

Problem Set 7

1. *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?

2. *UncleKarl.* Your Uncle Karl gives you 20,000 dollars of capital.

   (a) For \$1000, you can buy a risk-free government bond with a coupon of \$50 (payable at the end of the year), a face value of \$1050, and a maturity of one year. What is the yield on this bond?

   (b) Alternatively, you can invest some of the capital in a business venture providing downloadable music. For each dollar of capital invested over the course of one year, do you think it is more reasonable to let your cost of that capital be \$0.05, \$0.10, or \$0.15? Discuss your answer with reference to part (a), assuming you can buy fractional amounts of the bonds.

(c) To simplify, assume no labor is involved in this business; the only factor is capital. Your production function is $f(K) = 10K^{9/10}$, where output is measured in the number of downloads. You must also use $5,000 more of capital to pay a fixed cost to get started. What are the equations for your total, average, and marginal cost curves, using your answer to (b)? Graph the AC and MC curves.

(d) If each download brings you revenue of $0.04, how much capital should you invest in this business? Show this on your graph. Do you earn a competitive rate of return on your capital, or do you receive rents?

3. *SmallCountry.* Remember that a country's supply of loanable funds is the *net* supply after households that borrow are subtracted from those who save. Suppose there is a small country with 1000 households. 700 of these have a savings function $S_H(r) = 50r$, where r is the rate of return on capital. The remaining 300 households have savings function $S_L(r) = -1 + 10r$. (You can imagine that both the number of households and the amount of savings are in thousands.)

(a) Graph the individual and aggregate savings functions. Describe in words what happens to both types of household and the whole country when the interest rate rises from 3% to 11%.

(b) There are 100 firms, and each firm has a firm-level investment demand function $(I_F(r) = 10/r$. Find and graph the aggregate investment function for the whole country.

(c) Show that the equilibrium interest rate in this country is 16.6% (rounded to one decimal).

4. *SpanishBonds*. Suppose the Spanish government sold a bond.

   (a) Suppose each bond has a coupon of €3 and a face value of €100. The first coupon payment is 1 year from now, and the second payment is in 2 years. The bond matures in 2 years. It turns out that today the bond yields 3.46%. What is its price today? Show the full formula before solving.

   (b) If an average US consumer takes out a 3-year loan to pay for a new car, the interest rate they pay is 3.16%. It's strange that the yield on the 2-year Spanish government bonds is higher than that. How can this be?

Review Problems only, not to turn in:

5. *Lula*. Suppose there is a Brazilian government bond with a face value of R$100 (i.e. 100 reals, the currency of Brazil). The bond has a coupon of R$5 and matures in 1 year.

   (a) If the bond's current price is R$80, what is its yield?

   (b) Many investors thought that if Lula da Silva were elected president of Brazil, Brazilian debt would become more risky. Explain what probably happened to the price of Brazilian government bonds when Lula won.

6. *Deflate*. Given the information below about the U.S. economy, how much did real GDP grow between 1980 and 1990? Between 1990 and 2000?

	1980	1985	1990	1995	2000
Nominal GDP (trillions)	2.8	4.21	5.8	7.4	9.96
GDP deflator (1996=100)	57.0	73.7	86.5	98.1	106.9

Answers to Review Problems:

5. *Lula.*

   (a) The formula to use here is

   $$P = \frac{A}{1+i} \quad R\$80 = \frac{R\$5 + R\$100}{1+i} \Rightarrow 1+i = 1.3125 \Rightarrow i = 31.25\%$$

   (b) Investors perceived Lula as risky, and they demanded a higher risk premium on Brazilian government bonds. For an existing bond, the coupon and face value have already been set, so the only way for the yield to rise was for the present value to fall, as shown in the formula above.

6. *Deflate_a.* Total growth in real GDP between 1980 and 1990 was 36.5% and between 1990 and 2000 was 38.9%.