Lecture 9 - Recommended Problems

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☆☆☆ Chapter 10, Problem 3

Consider the production function:

$$Y = \sqrt{K}\sqrt{N}$$

a. Compute output when $K = 49$ and $N = 81$.

b. If both capital and labor double, what happens to output?

c. Is this production function characterized by constant returns to scale? Explain.

d. Write this production function as a relation between output per worker and capital per worker.

e. Let $K/N = 4$. What is Y/N? Now double K/N to 8. Does Y/N double as a result?

f. Does the relation between output per worker and capital per worker exhibit constant returns to scale?

g. Is your answer to (f) the same as your answer to (c)? Why or why not?

h. Plot the relation between output per worker and capital per worker. Does it have the same general shape as the relation in Figure 10-4? Explain.

☆☆☆ Chapter 10, Problem 4

The growth rates of capital and output. Consider the production function given in Problem 3 above. Assume that N is constant and equal to 1. Note that if $z = x^a$, then $g_z \approx a g_x$, where g_z and g_x are the growth rates of z and x.

a. Given the growth approximation here, derive the relation between the growth rate of output and the growth rate of capital.

b. Suppose we want to achieve output growth equal to 2% per year. What is the required rate of growth of capital?

c. In (b), what happens to the ratio of capital to output over time?

d. Is it possible to sustain output growth of 2% forever in this economy? Why or why not?

☆☆ Chapter 10, Problem 2

Assume that the average consumer in Mexico and the average consumer in the United States buy the quantities and pay the prices indicated in the following table:

	Food		**Transportation Services**	
	Price	**Quantity**	**Price**	**Quantity**
Mexico	5 pesos	400	20 pesos	200
United States	\$1	1,000	\$2	2000

a. Compute U.S. consumption per capita in dollars.

b. Compute Mexican consumption per capita in pesos.

c. Suppose that 1 dollar is worth 10 pesos. Compute Mexico's consumption per capita in dollars.

d. Using the purchasing power parity method and U.S. prices, compute Mexican consumption per capita in dollars.

e. Under each method, how much lower is the standard of living in Mexico than in the United States? Does the choice of method make a difference?

☆☆ Chapter 10, Problem 6

The Bureau of Labor Statistics has a user-friendly Web site of GDP per capita here. Find GDP per capita in Japan and in the United States in 1960, 1990, and the most recent year.

a. Compute the average annual growth rates of GDP per person for the United States and Japan for two time periods: 1960 to 1990 and 1990 to the most recent year available. Did the level of real output per person in Japan tend to converge to the level of real output per person in the United States in both these periods? Explain.

b. Suppose that in every year since 1990, Japan and the United States had each continued to have their average annual growth rates for the period 1960 to 1990. How would real GDP per person compare in Japan and the United States today?

c. What actually happened to growth in real GDP per capita in Japan and the United States from 1990 to 2011?

☆ Chapter 10, Problem 8

Growth successes and failures. Go here to the Web site containing the Penn World Table and collect data on real GDP per capita (chained series) for 1970 for all available countries (a direct link to the excel file is here, and to a (not so) user-friendly interface here). Do the same for a recent year of data, say one year before the most recent year available in the Penn World Table. (If you choose the most recent year available, the Penn World Table may not have the data for some countries relevant to this question.)

a. Rank the countries according to GDP per person in 1970. List the countries with the 10 highest levels of GDP per person in 1970. Are there any surprises?

b. Carry out the analysis in part (a) for the most recent year for which you collected data. Has the composition of the 10 richest countries changed since 1970?

c. Use all the countries for which there are data in both 1970 and the latest year. Which five countries have the highest proportional increase in real GDP per capita?

d. Use all the countries for which there are data in both 1970 and the latest year. Which five countries have the lowest proportional increase in real GDP per capita?

e. Do a brief Internet search on either the country from part (c) with the greatest increase in GDP per capita or the country from part (d) with the smallest increase. Can you ascertain any reasons for the economic success, or lack of it, for this country?