Economics 102
Spring 2018
Homework #4
Due 4/5/17

Directions: The homework will be collected in a box **before** the lecture. Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Please remember the section number for the section **you are registered**, because you will need that number when you submit exams and homework. Late homework will not be accepted so make plans ahead of time. **Please show your work**. Good luck!

Please remember to

- Staple your homework before submitting it.
- Do work that is at a professional level: you are creating your "brand" when you submit this homework!
- Not submit messy, illegible, sloppy work.

1. Aggregate Production Function

Consider the aggregate production function for Dane County:

$$\mathbf{Y = 2K^{1/2}L^{1/2}}$$

where Y is real GDP, K is units of capital, and L is units of labor. 2 denotes the state of the technology in Dane County. Labor and capital are the only inputs used in Dane County to produce real GDP. Initially K is equal to **16** units. Answer the following questions based on the above information **(you are required to utilize Excel when answering this question).**

Direction for this problem: You don't need to submit the whole simulated data tables with your homework, but you do need to submit the graphs drawn from theses tables. **The graphs must be generated by using Excel, NOT by your hands.**

Scenario 1: Baseline Model

a. Fill in the following table (you will need to expand it from the truncated form provided here when using Excel). Round all your answers to the nearest hundredth. In your answer you may present the table for L from 1 to 10 units and from 90 to 100 units (that is, you can omit part of the table in the homework you turn in).

L	K	Y	MPL	Y/L
0	16			
1				
2				
…				
100				

b. Describe verbally what happens to the marginal product of labor as the level of labor usage increases in Dane County. Explain the intuition behind this change in the marginal product of labor.

c. As the amount of labor increases, what happens to labor productivity? Explain why labor productivity exhibits this pattern.

Scenario 2: Change in capital (K)

d. Now suppose an American multinational technology company decides to invest in Dane County, and as a result of this decision, the amount of capital stock (K) increases to 25 units. We also assume that the level of technology is held constant. Describe in words how this change in capital will cause the aggregate production function to change.

e. Given the change in capital described in (d), fill in the following table (you will need to expand it from the truncated form provided here).

L	K	Y	MPL	Y/L
0	25			
1				
2				
…				
100				

f. Use Excel to graph the original aggregate production function and the new aggregate production function in a graph with L on the horizontal axis and Y on the vertical axis. Does the graph support your prediction in (d)?

Scenario 3: Change in technology (A)

g. Now suppose this American multinational technology company decides not to invest capital in Dane County, but brings Artificial Intelligence and Machine Learning techniques to improve the operation of local factories in Dane County. As a result, the state of the technology in Dane County increases from 2 to 3. Assume that K is still at its initial level. Describe in words how this change in technology will cause the aggregate production function to change.

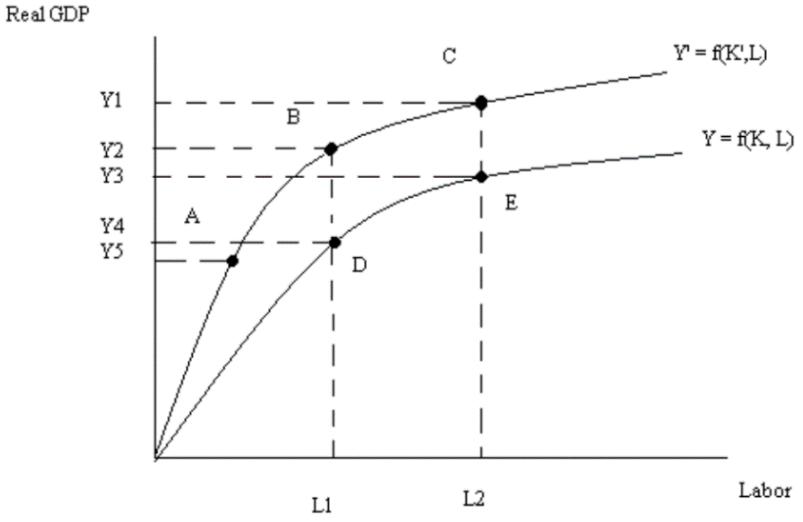
h. Given the change in technology described in (g), fill in the following table (you will need to expand it from the truncated form provided here).

L	K	Y	MPL	Y/L
0				
1				
2				
…				
100				

i. Use Excel to graph the original aggregate production function and the new aggregate production function in a graph with L on the horizontal axis and Y on the vertical axis. Does the graph support your prediction in (g)?

2. Labor and Capital Productivity

Use the graph below of an economy's aggregate production function to answer the following set of questions. Assume this economy uses only capital (K) and labor (L) to produce real GDP.



a. Suppose this economy is initially producing at point D but then moves to point B. Explain verbally the change in the economy that results from this movement. Explain what caused this economy to move from D to B given the above graph.

b. Given the change described in (a), what happened to labor productivity? Explain your answer.

c. Now suppose that the economy is initially at point D and then something changes in this economy so that the economy produces at point E. Describe verbally what changed and then comment on how this movement from point D to point E affects labor productivity.

d. Given the change in (c), describe what happened to capital productivity as you moved from point D to point E.

3. Rule of 70

The following table gives the annual growth rate of real GDP for 4 countries in 2016. Assume there is no population growth in any of the four countries.

	China	Japan	Russian Federation	Brazil
Real GDP Annual growth rate	6.1 %	1.1%	-0.4%	-4.4%

Data Source: World Bank national accounts data. (https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG)

a. Which countries can we apply the Rule of 70 to determine how long it will take their real GDP to double? Explain your answer.

4. Loanable Funds Market

Consider the loanable funds market for an economy. Initially the government of this economy is running a balanced budget. You are told that the demand for loanable funds curve is linear and that at an interest rate of 1%, $5,300 worth of loanable funds are demanded and at an interest rate of 5%, $3,300 worth of loanable funds are demanded. You are also told that the supply of loanable funds curve is linear and when interest rates are at 10%, $1,500 worth of funds are supplied and when the interest rate is 2.5%, there are no funds supplied. Assume that this economy is initially a closed economy.

a. Given the above information, write an equation for the supply of loanable funds curve where r is the interest rate and Q is the quantity of loanable funds supplied. (If the interest rate is 3%, then the r in the equation would be 3). Assume that the interest rate is measured on the vertical axis and thus, provide your equation in slope-intercept form.

b. Given the above information write an equation for the demand for loanable funds curve where r is the interest rate and Q is the quantity of loanable funds demanded. (If the interest rate is 3%, then the r in the equation would be 3). Assume that the interest rate is measured on the vertical axis and thus, provide your equation in slope-intercept form.

c. Given the above information, what is the equilibrium interest rate and the equilibrium quantity of loanable funds?

Scenario 1: Start with the initial situation. Then, suppose the government increases government spending by $3400 while raising taxes by $2000. Answer the following questions and show the work you did to find your answers.

I. What will be the:

a. equilibrium level of interest rate?
b. equilibrium level of loanable funds?
c. equilibrium level of private saving?
d. equilibrium level of private investment spending?

II. How much does private investment spending change compared to the level of private investment spending at the initial equilibrium?

Scenario 2: Start with the initial situation. Then, suppose the government increases government spending by $2000 while raising taxes by $3400. Answer the following questions and show the work you did to find your answers.

I. What will be the:

a. equilibrium level of interest rate?
b. equilibrium level of loanable funds?
c. equilibrium level of private saving?
d. equilibrium level of private investment spending?

II. How much does private investment spending change compared to the level of private investment spending at the initial equilibrium?

Scenario 3: Start with the initial situation. Then, suppose this economy opens to international trade and the resulting trade surplus is $1,050. Answer the following questions and show the work you did to find your answers.

I. What will be the:

a. equilibrium level of interest rate?
b. equilibrium level of loanable funds?
c. equilibrium level of private saving?
d. equilibrium level of private investment spending?

II. How much does private investment spending change compared to the level of private investment spending at the initial equilibrium?

5. Loanable Funds Market with Trade Deficit and Surplus

Suppose that the loanable funds market is initially in equilibrium and the country has zero net exports and is currently operating with a balanced budget. Provide your analysis about the market equilibrium for each of the following scenarios.

a. Holding everything else constant, what do you predict about the equilibrium interest rate, the equilibrium level of loanable funds and the equilibrium level of private saving if the country runs a trade deficit and at the same time loses funds that a major foreign company is providing as a source of funds to this economy? Explain your answer verbally and provide a graph of the loanable funds market to support your analysis. Make sure your graph is clearly labeled.

b. Holding everything else constant, what do you predict about the equilibrium interest rate, the level of private investment, the level of private saving, the level of consumption spending and the equilibrium level of loanable funds if the country runs a trade surplus and at the same time increases the size of the government deficit? Explain your answer verbally and provide a graph of the loanable funds market to support your analysis.(Just show the old and new equilibrium level of interest rate and loanable funds in your graph) Make sure your graph is clearly labeled.