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Elements of Macroeconomics
180.101.21
Summer 2018

Problem Set 1

Due July 9th at 2 pm

Problem sets submitted after class will not be graded.

Section I (30 points)

Consider the following two production possibility schedules:

(in millions)	**Hockey Pucks**	**Soccer Balls**
Canada	10	50
Brazil	5	30

1. What is the opportunity cost of producing one million hockey pucks in Canada? **(2 points)**

   50/10 = 5 million soccer balls

2. What is the opportunity cost of producing one million soccer balls in Brazil? **(2 points)**

   5/30 = 0.17 million hockey pucks

3. What is the opportunity cost of producing one million soccer balls in Canada? **(2 points)**

   10/50 = 0.2 million hockey pucks

4. What is the opportunity cost of producing one million hockey pucks in Brazil? **(2 points)**

   30/5 = 6 million soccer balls

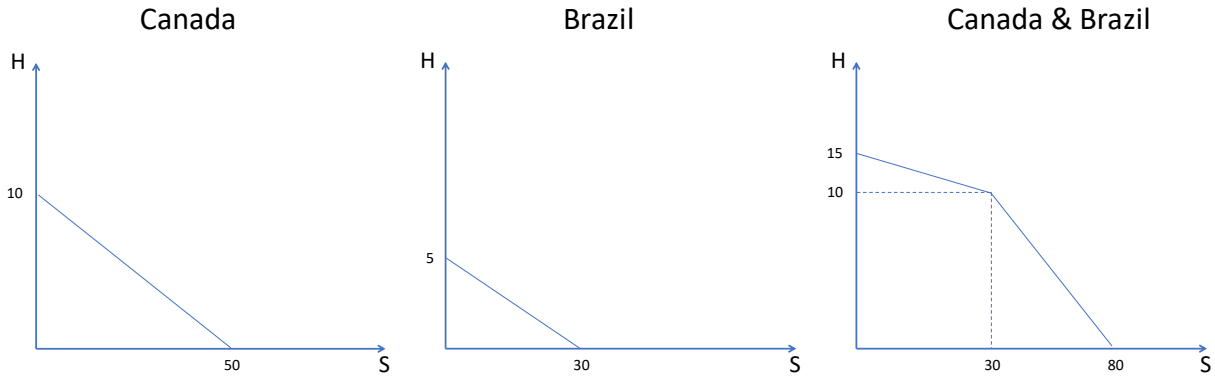
5. Which country has the comparative advantage in the production of hockey pucks? **(2 points)**

   Canada because its opportunity cost is lower (5 < 6)

6. Which country has the absolute advantage in the production of soccer balls? **(2 points)**

   Canada because with same inputs can produce more (50 > 30)

7. Draw the production possibility frontiers, assuming a linear trade-off between hockey pucks and soccer balls for both countries. Then draw the combined production possibility frontier (Specify the values of any corner and kink points). **(6 points)**



8. Suppose Brazil and Canada historically did not trade, due to a fight over whether hockey should be in the Olympics. If each country's tastes drive both to produce 20 million soccer balls, fill in the blanks below (as an economist, assume that both countries produce on the production possibility frontier line). **(2 points)**

Pre-Trade Goods Levels

(in millions)	Hockey Pucks	Soccer Balls
Canada	6	20
Brazil	1.67	20

9. Now suppose Brazil relents and embraces hockey as a 'real sport'. Trade begins between Canada and Brazil. Brazil wants the same number of soccer balls for its citizens as before, but now produces 30 million soccer balls and sends the excess to Canada. In exchange, Canada sends 1.8 million hockey pucks to Brazil. Canada consumes the same number of hockey pucks as it did before trade. Fill in the table below: **(8 points)**

Post-Trade Goods Levels

(in millions)	Hockey Pucks	Soccer Balls
Canada	6	10 + 11 = 21
Brazil	1.8	20

10. Are both nations better off? Briefly explain. **(2 points)**

Yes. Each country receives an allocation that is outside their production possibility frontiers in the case of no trade. In other words, both countries consume same or more of each product.

Section II (25 points)

Consider the following monthly data on employment for the country of Stormlands:

Month	Employment (thousands)
December	9,452.5
January	9,465.2
February	9,472.9
March	9,498.3
April	9,516.3
May	9,539.5
June	9,553.8
July	9,574.8

1. Calculate the monthly percent change in June **(3 points)**

$$\left[\frac{9{,}553.8}{9{,}539.5} - 1\right] \times 100 = 0.15\%$$

2. Calculate the monthly percent change in July **(3 points)**

$$\left[\frac{9{,}574.8}{9{,}553.8} - 1\right] \times 100 = 0.22\%$$

3. Calculate the percent change between December and May **(3 points)**

$$\left[\frac{9{,}539.5}{9{,}452.5} - 1\right] \times 100 = 0.92\%$$

4. What is the annualized percentage change…
    a. In June **(4 points)**

$$\left[\left(\frac{9{,}553.8}{9{,}539.5}\right)^{12} - 1\right] \times 100 = 1.81\%$$

    b. In July **(4 points)**

$$\left[\left(\frac{9{,}574.8}{9{,}553.8}\right)^{12} - 1\right] \times 100 = 2.67\%$$

c. From December to May **(4 points)**

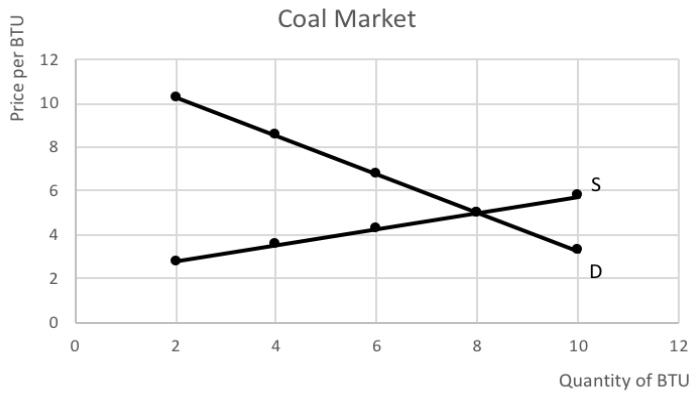
$$\left[\left(\frac{9{,}539.5}{9{,}452.5}\right)^{\frac{12}{5}} - 1\right] \times 100 = 2.22\%$$

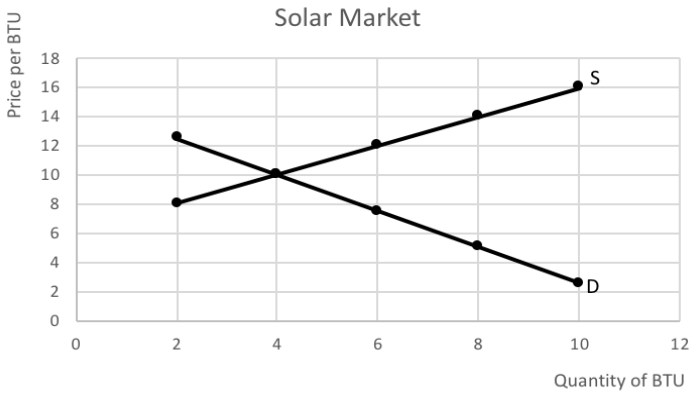
5. Would employment growth in June and July be above or below the pace set in the first five months of the year? **(4 points)**

Employment growth in June (1.81%) was below the rate established in the first five months (2.22%), while the July figure (2.67%) was above it, in annualized terms.

Section III (25 points)

In 2015, the price of coal-generated electricity was $5 per btu (a unit of energy) while the price of solar energy generated electricity was $10 per btu. The equilibrium quantities were 8 billion in coal market and 4 billion in the solar energy market. Label the graphs below so that we are in equilibrium in both markets (label each axis and curve for each market). **(10 points)**





1. Suppose there is a technological breakthrough in 2019, and the cost of producing electricity using solar panel plunges. Suppose in 2020 the market achieves a new equilibrium. Suppose the new equilibrium price per btu, in the market for solar energy, moves to $5.

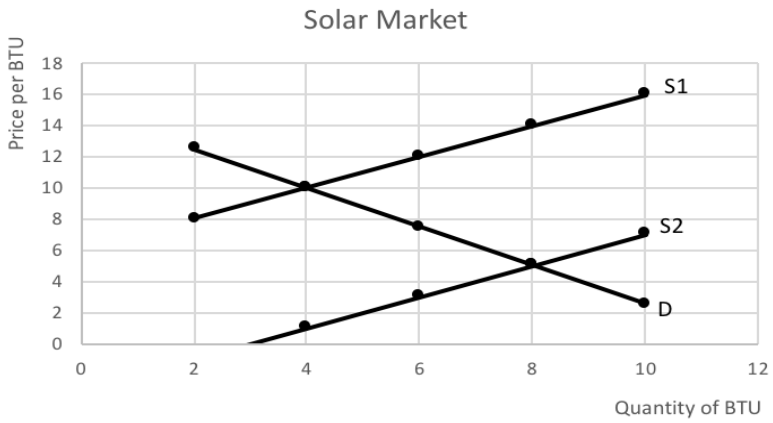
   a. Did the supply curve or demand curve shift for solar energy? **(2 points)**

   Supply curve

   b. Did we move along the supply or demand curve for solar energy? **(2 points)**

   Demand curve

   c. Draw the shift so that it correctly represents the new equilibrium. **(3 points)**



   d. What is the new equilibrium quantity of solar electricity purchased? **(2 points)**

   8 billion

   e. Should we expect this to affect the market for coal? If so, is it because they are substitutes or compliments? **(2 points)**

   Yes. They are substitutes

   f. Did a curve shift in the coal market's supply-demand space? If so, which one? **(2 points)**

   Decline in the demand for coal given technological breakthrough in solar

   g. Suppose the total equilibrium quantity of electricity consumed is unchanged in 2020 relative to the equilibrium level in 2015. What must the new equilibrium quantity be for purchases of coal-generated electricity? **(2 points)**

   The new equilibrium quantity in solar is 8 billion
   The new equilibrium quantity in coal is 4 billion (12 billion – 8 billion)

Section IV (20 points, 5 points each)

Consider the market for marmalades. In this market, the supply curve is given by $Q_s = 10P_M - 5P_O$ and the demand curve is given by $Q_d = 100 - 15P_M + 10P_B$, where M denotes marmalades, O denotes oranges, and B denotes butter.

1. Assume that P_O is fixed at \$1 and $P_B = 5$. Calculate the equilibrium price and quantity in the marmalade market.

   Equilibrium is attained when demand equals supply

   $$Q_s = Q_d$$
   $$10P_M - 5 = 150 - 15P_M$$
   $$25P_M = 155$$
   $$P_M = 6.2$$

   Substitute the value of P_M in one curve

   $$Q_d = 150 - 15 \times 6.2$$
   $$Q_d = 57$$

2. Suppose that a poor harvest season raises the price of oranges to $P_O = 2$. Find the new equilibrium price and quantity of marmalade.

   Equilibrium is attained when demand equals supply

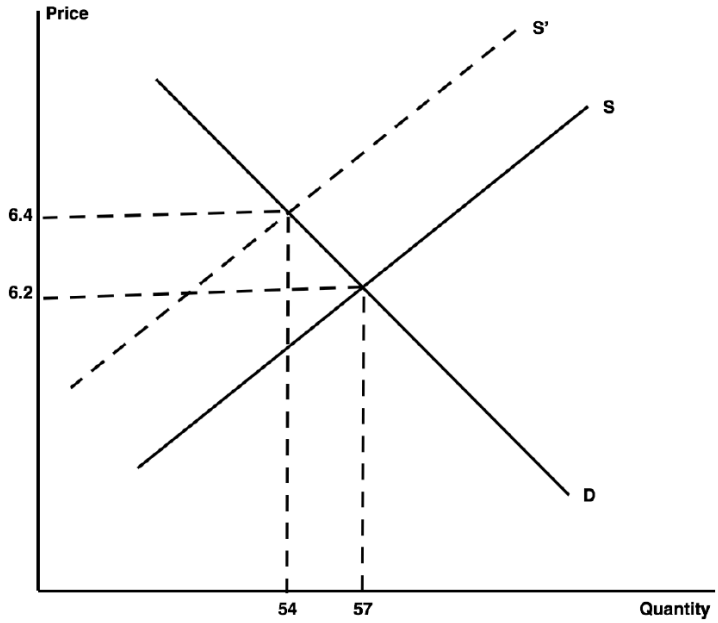
   $$Q_s = Q_d$$
   $$10P_M - 10 = 150 - 15P_M$$
   $$25P_M = 160$$
   $$P_M = 6.4$$

   Substitute the value of P_M in one curve

   $$Q_d = 150 - 15 \times 6.4$$
   $$Q_d = 54$$

3. For part (b), identify the curve that would shifts because of poor harvest. Illustrate in a graph below.

   Poor harvest will cause the supply curve for marmalades to shift left



4. Suppose $P_O = 1$ but the price of butter drops to $P_B = 3$. Find the new equilibrium price and quantity of marmalade.

$$Q_s = Q_d$$
$$10P_M - 5 = 130 - 15P_M$$
$$25P_M = 135$$
$$P_M = 5.4$$

$$Q_d = 130 - 15 \times 5.4$$
$$Q_d = 49$$