

EE 320 Introductory Mathematical Economics

Semester 2/2012

Problem Set 3

Equilibrium Analysis

1. (From Tubpun, 2010)

Suppose that the cost function is given by $C = 33 + 2Q$.

- If the price per unit is \$13, how many units of output should the producer sell in order to breakeven?
- If the producer produces 20 units of output and sells at \$13 per unit, what is the profit obtained by this producer?

2. (From Dowling, 2012)

Given the following set of simultaneous equations for two related markets, beef (B) and pork (P):

$$Q_{dB} = 82 - 3P_B + P_P \quad \text{and} \quad Q_{sB} = -5 + 15P_B$$

$$Q_{dP} = 92 + 2P_B - 4P_P \quad \text{and} \quad Q_{sP} = -6 + 32P_P$$

Find the equilibrium price and quantity for each market.

3. (From Sydsaeter and Hammond, 2006)

Consider the demand and supply functions:

$$Q_d = 150 - 0.5P \quad \text{and} \quad Q_s = 20 + 2P$$

- Find the equilibrium price and the corresponding quantity.
- Suppose a tax of \$2 per unit is imposed on the producer. How will this influence the equilibrium price?
- Compute the total revenue obtained by the producer before and after the tax is imposed.

4. (Adapted from Tubpun, 2010)

Consider the demand and supply functions of a good:

$$Q_d = 260 - 5P \quad \text{and} \quad Q_s = -40 + 15P$$

- Find the equilibrium price and the corresponding quantity.
- In order to encourage the use of this good, the government subsidizes the producers by giving them \$4 per unit of the good sold. Find the new equilibrium price and quantity after the government subsidization.
- Use a graph to illustrate the impact of the subsidization program on the equilibrium price and quantity.
- Find the amount of money the government needs for this subsidization program.

5. Given a simple macroeconomic model:

$$Y = C + I$$

$$C = 100 + 0.6Y_d$$

$$I_0 = 40$$

$$Y_d = Y - T$$

- Suppose T is a lump-sum tax and is equal to 50. Find the equilibrium national income.
- Suppose T is a proportional tax where $T = 0.04Y$. Find the equilibrium national income.
- Use graphs to illustrate the difference between the two equilibrium income levels obtained in part a) and part b).

6. Consider the following IS-LM model:

$$Y = C + I + G$$

$$C = 100 + 0.8Y_d$$

$$I = 80 - 100r$$

$$G = 100$$

$$Y_d = Y - T$$

$$T = 0.25Y$$

$$M_s = 2500$$

$$M_d = M_{tp} + M_z,$$

$$M_{tp} = 0.1Y$$

$$M_z = 2500 - 150r$$

where M_{tp} = transaction-precautionary demand for money

M_z = speculative demand for money

- Write the IS and LM equations
- Find the equilibrium national income and rate of interest
- If the investment function is now $I = 300 - 100r$, find the equilibrium national income and interest rate. Use an IS-LM diagram to illustrate the impact of this change in investment.
- Suppose that the money supply increases to 2563, find the equilibrium national income and interest rate. Also, use an IS-LM diagram to illustrate the impact of the change in money supply.