# EE 320 Introductory Mathematical Economics

Semester 2/2012

**Homework 1**

Due 29 January 2013 (3pm)

*There are five questions in total. Each of them is worth equally.*

1. Market demand is the sum of the demands of all buyers. Similarly, market supply is the sum of the supplies of all sellers. Suppose that Nadech and Mark are the only two buyers in the coffee market, and individual demands of Nadech and Mark for coffee are $Q^D_{Nadech} = 5 - 3P^2$ and $Q^D_{Mark} = 4 - P^2$. Suppose further that Starbuck and Starbung are the only two sellers in the market, and their individual supplies for coffee are $Q^S_{Starbuck} = 2 + 5P$ and $Q^S_{Starbung} = 5 + 2P$. Find the market demand, market supply, equilibrium price, and equilibrium quantity.

2. Consider the following system of equations:

$$Q_{d1} = 23 - 5P_1 + P_2 + P_3 \qquad Q_{s1} = -8 + 6P_1$$
$$Q_{d2} = 15 + P_1 - 3P_2 + 2P_3 \qquad Q_{s2} = -11 + 3P_2$$
$$Q_{d3} = 19 + P_1 + 2P_2 - 4P_3 \qquad Q_{s3} = -5 + 3P_3$$

   a. What is the relationship between the three goods?
   b. Find the equilibrium price and quantity for the three goods.

3. Given the following supply and demand functions:

$$Q^D = 75 - 4P$$
$$Q^S = 20 + 2P$$

   a. Suppose that the government imposes a 50% ad valorem tax *on consumers*, what are the new equilibrium prices for consumers and producers?
   b. Suppose now that the government imposes a 50% ad valorem tax *on producers*, what are the new equilibrium prices for consumers and producers? Are they the same as the prices obtained in part a.?

4. Let the national-income model be:

$$Y = C + I_0 + G_0 + X_0 - M$$
$$C = C_0 + bY_d, \quad (C_0 > 0, 0 < b < 1)$$
$$Y_d = Y - T, \quad \text{where } T \text{ is a constant}$$
$$M = M_0 + mY, \quad (M_0 > 0, 0 < m < 1)$$

   a. Find the equilibrium level of national income.
   b. Find the impact of an exogenous increase in government expenditure on the equilibrium national income (i.e. $\frac{\Delta Y^*}{\Delta G}$ = ?) . Assume everything else remains constant.

c. Given that $C_0 = 70$, $b = 0.8$, $I = I_0 = 80$, $G = G_0 = 75$, $T = 25$, $X = X_0 = 65$, $M_0 = 40$, *and* $m = 0.3$, find the equilibrium national income.
d. From part c., if T = 40, what is the change in the equilibrium national income?

5. Consider the following IS-LM model:

Commodity market:

$$Y = C + I + G_0$$
$$C = bY, \qquad (0 < b < 1)$$
$$I = I_0 - ar, \quad (I_0 > 0, a > 0)$$

Money market:

$$M_S = M_0$$
$$M_D = mY - hr, \quad (m > 0, h > 0)$$

a. Suppose that $I_0 = 750$, $G_0 = 500$, $b = 0.8$, $a = 1000$, $h = 1500$, $M_0 = 500$, and $m = 0.2$. Write out the explicit IS-LM system of equations.
b. Determine the equilibrium national income and equilibrium interest rate.