

EE320 Introductory Mathematical Economics

Quiz 1

1. Consider the following *IS-LM* model:

Commodity market:

$$Y = C + I$$

$$C = C_0 + bY$$

$$I = I_0 - ir$$

Money market:

$$M_s = M_0$$

$$M_d = kY - hr$$

- a. (4 points) Write the *IS* and *LM* equations.

$$\text{IS: } Y = \frac{C_0 + I_0 - ir}{1 - b}$$

$$\text{LM: } Y = \frac{M_0}{k} + \frac{h}{k}r$$

- b. (4 points) Given that $C_0 = 500$, $b = 0.6$, $I_0 = 250$, $i = 100$, $M_0 = 300$, $k = 0.2$, and $h = 200$, find the equilibrium level of national income and the equilibrium rate of interest.

$$Y^* = 1800$$

$$r^* = 0.3$$

- c. (4 points) Suppose that the money supply increases by 50 (i.e. $\Delta M_0 = 50$). Determine the change in the equilibrium income and interest rate.

$$\Delta Y^* = 150 \text{ (New } Y^* = 1950)$$

$$\Delta r^* = -0.2 \text{ (New } r^* = 0.1)$$

2. (4 points) Given the demand function $P = 20 - 3Q_d - Q_d^2$ and the supply function $P = 5 - 10Q_s + 3Q_s^2$, determine the equilibrium price and quantity.

At equilibrium $Q_d = Q_s$.

$$\text{Thus, } P = 20 - 3Q - Q^2 = P = 5 - 10Q + 3Q^2$$

$$\Leftrightarrow P^* = 2, Q^* = 3$$

3. (4 points) Given the system of equations:

$$Q_d = 6 - 2P$$

$$Q_s = -4 + 3P$$

$$Q_d = Q_s$$

Write the above system of equations in a matrix form $AX = d$, where A is the coefficient matrix, X is the vector of variables, and d is the vector of constants.

$$\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -3 \\ 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} Q_d \\ Q_s \\ P \end{bmatrix} = \begin{bmatrix} 6 \\ -4 \\ 0 \end{bmatrix}$$