

Extra practice problem sets (Midterm review questions)

Note: Students should have already attempted the all PPS and assignments before attempting this review question. Use this review question at your own risk! No solution will be given!

1. **(Easy)** Suppose you are the manager of an airline company. As a BE student, you decided to use all the knowledge you have acquired to improve the firm's pricing decisions. To begin with, you search for a market survey company to find out the demand curve for flights. The market survey company sent you back a report stating that there are two distinct segments of consumers - tourists and business travelers - and that their demand curves are given by the following equations:

$$\text{Market Demand for Tourists: } Q = 500 - 2P + 2I$$

$$\text{Market Demand for Business Travelers: } Q = 1000 - P + I$$

where Q is the quantity demanded (in thousands of tickets), P is the price for a ticket, and I is the median income of each segment of consumers. Currently, the price for tourists is \$200 and the price for business travelers is \$500. Moreover, the median income of tourists is \$50 and the median income of business travelers is \$100.

- a. Is the airline ticket considered normal or inferior goods?
 - b. Using the point slope elasticity formula, what is the price elasticity of demand for airline tickets at the current price and income level for each group of consumer?
 - c. Based on your result in (a), do you think you should raise or lower the price paid by tourists? What about the price paid by business travelers?
2. **(Basic; tax)** Consider the following market demand and market supply curves for scissors where P is the price per scissor and Q is the quantity of scissors.

$$\text{Demand: } P = 11 - \left(\frac{1}{100}\right) Q$$

$$\text{Supply: } P = 2 + \left(\frac{1}{200}\right) Q$$

- a. Given the above information find the equilibrium price and quantity in this market. Show your work.
 - b. Calculate the point elasticity of demand at equilibrium. Provide the general formula and show your calculations. Is demand elastic or inelastic? Explain your answer. Given this answer, will producers enhance their total revenue by increasing or by decreasing the price they charge for scissors?
 - c. Calculate the point elasticity of supply at equilibrium. Provide the general formula and show your calculations. Is supply elastic or inelastic? Explain your answer.
 - d. Use the inverse matrix and solve for the equilibrium price and quantity.
3. **(Basic; ad-valorem tax)** Consider a market model where market demand equation and market supply equation are given by $Q = a - bp$ and $Q = c + dp$, respectively. Assume that all coefficients are STRICTLY positive. Answer the following question
- a. Calculate the equilibrium price and quantity before tax.
 - b. Discuss about the restrictions required so that market equilibrium exist. To ensure the existence, is it sufficient to assume that $a > c$?
- Suppose that government impose a sale tax of $t\%$ on the consumer.
- c. Calculate the equilibrium after tax.
 - d. Calculate the excess burden of consumers and the excess burden of producers.
 - e. What is the total government revenue?
 - f. In terms of both percentage and total size, how much does the consumer contribute to the tax revenue?
 - g. In terms of both percentage and total size, how much does the producer contribute to the tax revenue?
4. **(Basic; subsidy)** Consider the market for soybeans. The demand curve is given by the equation $p = (-1/10) * q^d + 700$ and the supply curve is given by $q^s = 2p - 200$.
- a. Discuss about the existence condition of the market equilibrium, and then calculate the equilibrium price and quantity in the market for soybeans.

- b. Bio-diesel is made from soybeans, and in an attempt to lessen the dependence on foreign oil, the government establishes a price subsidy for producers of soybeans of \$60 per bushel. What is the new equilibrium price and quantity in the market for soybeans given this subsidy?
 - c. Discuss about the distribution of the benefit received by each party in the market. Who gain more? Why?
 - d. How much does this subsidy cost the government?
5. **(Moderate; market demand)** Suppose that in the market for pineapples there are three consumers: person A whose demand curve is $Q^A = -P + 5$, person B whose demand curve is $Q^B = -2P + 6$, and person C whose demand curve is $Q^C = -\left(\frac{3}{4}\right)P + 3$.
- a. Determine who demands pineapples at what price ranges.
 - b. Properly define individual demand by using the step function.
 - c. Derive market demand equation. Use the direct summation approach.
 - d. Suppose that market supply equation is given by $P = \frac{1}{2}Q + 5$, solve for the market equilibrium.
 - e. At the equilibrium, what is firms' total revenue?
 - f. How much does *each* consumer spend in the equilibrium? Do they spend equally?
6. **(Moderate; market supply)** Suppose that market demand curve can be given by $6Q + 3P = 30$
- a. Draw market demand curve. Make sure you correctly specify the axis in your diagram.

Now assume further that, in this market, there are two producers, namely A and B. Suppose that each has an individual supply equation given by: $P = Q + 12$ and $Q = 2P - 2$.

- b. Draw individual supply curves. Label your curve for each firm.
- c. Draw market supply curve.
- d. Find the equation that represents the market supply curve. (Hint: your answer should be given in terms of p-equal form.)
- e. Discuss about the existence of market equilibrium. Solve for market equilibrium price and quantity
- f. Under the equilibrium, how many active suppliers are there in the market?

g. At the equilibrium, how much revenue does each firm receive?

7. (Keynesian macroeconomics)

In an economy which engages in foreign trade, it is assumed that

$$\begin{aligned} Y &= C + I + G + X - M \\ C &= 0.9Y_t \\ Y_t &= (1 - t)Y \\ \text{and imports } M &= 0.15Y_t \end{aligned}$$

Find the equilibrium value of Y given the following values:

$$I = \text{£}200\text{m} \quad G = \text{£}270\text{m} \quad X = \text{£}180\text{m} \quad t = 0.2$$

What is the balance of payments surplus/deficit at this value?

Note Y_t = disposable income

8. (Two country Keynesian cross)

Suppose there are only two countries, country A and B. (unit: million Baht) The two countries trade with each other. Assume no government spending in both countries.

$$\text{Country A : } C_A = 150 + 0.4Y_A$$

$$M_A = 0.6Y_A$$

$$I_A = 250$$

$$\text{Country B : } C_B = 100 + 0.5Y_B$$

$$M_B = 0.4Y_B$$

$$I_B = 200$$

where C = Consumption

Y = Income

I = Investment

M = Import

a. Based on the information given above, can we find the exports of both country? What do we know about the exports of each of the two countries?

- b. State the open-economy equilibrium conditions.
- c. Determine equilibrium income (Y_A^*, Y_B^*) of these two countries.
- d. Determine balance of payments at equilibrium income from (b) of these two countries.

9. (Matrix algebra; demand)

Assume that demand for good (Q) depends on its own price (P), income (M) and the price of a substitute good (S) according to the demand function

$$Q_i = \beta_1 P_i + \beta_2 M_i + \beta_3 S_i$$

where β_1 , β_2 , and β_3 are parameters whose values are not yet known and the subscript i denotes the observation number. Three observations of the amount Q demanded when P , M and S take on different values are shown below:

Observation number	P	M	S	Q
1	6	5	5	4
2	8	8	6	6.4
3	5	6	4	5.1

Find the values of β_1 , β_2 and β_3 by setting up the relevant system of simultaneous equations in matrix format and solving using the inverse matrix.

Use the vector of parameters β that you have found to predict the value of Q when P , M and S take the values 7, 9 and 10, respectively, by vector multiplication.

10. (Matrix algebra; market model)

The demand and supply functions of a two-commodity market model are as follows:

$$\begin{aligned} Q_{d1} &= 18 - 3P_1 + P_2 & Q_{d2} &= 12 + P_1 - 2P_2 \\ Q_{s1} &= -2 + 4P_1 & Q_{s2} &= -2 + 3P_2 \end{aligned}$$

- a. Write the model in terms of matrix representation. What is the size of your coefficient matrix?
- b. Use the Cramer's rule for find the equilibrium price and equilibrium quantity in each market.

Old exam questions

11. (**Tedious, and quite hard**) Consider a market model for product “x”. In the market, we have *two identical consumers* and *two heterogeneous producers*. Suppose that demand function for each consumer can be given by $Q_x = 6 - 2p_x + 4p_y$, where p_y is the price of good y. And, the two equations for supply curve of each producer are $p_x = 2Q_x$ and $p_x = Q_x$. Consider the following questions.

- State the relationship between good x and good y. Can we say that good x is an inferior product, just simply based on the given equation?

From now on, let's assume that $p_y = 5$.

- Find the equation for market demand. (You can use whichever method, but make sure you correctly specify the domain of the function.)
- Draw the two individual supply curves on the same diagram, and label all the important points of each curve.
- Using the horizontal summation approach, would the equation for market supply curve be equal to $P_x = 3Q_x$?
- If the proposed solution in “d” is wrong, explain why it's wrong and find the correct equation for market supply curve. (Hint: when I refer to the market supply curve, your equation should be written in terms of p-equal form.)
- Use your information in “b” and “e” to find the market equilibrium. How much would each producer produce in the equilibrium? How much is the quantity that each consumer consumes?
- Only use the information in “a” to intuitively explain what happen to the market of good X if government taxes good y for 10% of unit price. (Hint: Alternatively, you can answer this question by solving for the new equilibrium price and quantity of good X by using new price of good Y which is 10% higher than before. But, this is tedious, and so don't do it because you're not asked to. I only want to make sure you know/understand the logic behind the Ceteris paribus concept.)

Continue with the assumption that $p_y = 5$. But, now suppose that the government taxes consumers by using the value-added tax. The value added tax is charged on the consumer of

final goods in terms of x% of unit price paid at the cashier counter. For simplicity, assume that value-added is 5%. Consider the following questions.

- h. Rewrite the new equations that represent market demand and market supply after the value-added tax is put in place. (Hint: As we discussed in class, it helps to distinguish P_x into two prices, namely P_x^D and P_x^S . The former is price of consumer and the latter is the price of producer.)
- i. What is the relationship in the equilibrium between P_x^D and P_x^S , given the structure of tax that will be imposed on consumers.
- j. Use the condition in “i” and draw the market demand curve on p-q diagram. To make everything easy, put the vertical axis in your diagram as P_x^S , i.e. price of producer. Does the whole market demand curve shift up parallel in the same way as when a simple unit tax is imposed?
- k. Solve for market equilibrium after tax. How much consumer is paying more, compared to before tax equilibrium? Calculate consumers’ and producers’ burden.
- l. How much is the total revenue that government can collect?
- m. In terms of the distributional impact, who share the most responsible on tax payments? How much does each consumer chip in? How much does each producer chip in?

12. (**VERY Hard**) Consider a market with 10 identical consumers. Each of the consumer’s demand function is given by:

$$P = 10 + k_1 P_x + k_2 Y - Q_j^d,$$

where P is the unit price of the product sold in this market, Q_j^d is the amount of quantity demanded by the j-th consumer, P_x is the price of product x, and Y is the level of income. Assume further that the industry is controlled by two producers, each of whom has the following supply function:

$$P = 5 + k_3 W + Q_1^s, \quad \text{and}$$

$$P = 20 + k_4 T + 2Q_2^s,$$

where Q_1^s and Q_2^s are the amount of quantity supplied by the first and second producer, respectively. W is the price of gasoline and T is the level of technology. All the parameters are STRICTLY positive.

Use the information given to answer the following questions:

- Is “product x” considered as a *substitute* product or a *complementary* product?
- Derive the market demand equation.

Now, I supplement two pieces of information to be used in the remaining parts of this question. That is, I assume that

(i) $0 < (20 + k_4T) < (5 + k_3W)$ and (ii) $1 + k_1P_x + k_2Y > 5 + k_3W$

- What does the first condition mean in terms of the relative cost advantages between the two firms? Given your interpretation, derive the market supply equation.
- Given (i) and (ii), state the condition under which the market ceases to have only *single* firm that stays active in the business?

Continue with the information given above, but now consider a specific case where the value of coefficients and exogenous variables are given in the following table:

Coefficients	k_1	k_2	k_3	k_4
Value	1	1	1	1

Variables	Y	P_x	w	T
Value	5	5	10	5

- Solve for the equilibrium price *and* quantity.
- Suppose that the government provides a subsidy of \$5 for each unit of output that the consumers have purchased. Calculate the benefit that consumers and each of the two producers receive under the subsidy program.

13. (VERY Hard) National income model

Consider a modified version of the IS-LM model where government spending is tied to the level of GDP (Y).

$$C = C_0 + C_1 Y_d, \quad 0 < C_1 < 1$$

$$I = I_0 + I_1 Y - I_2 r, \quad 0 < I_1 < 1$$

$$G = G_0 - G_1 Y, \quad 0 < G_1 < 1$$

$$T = T_0$$

$$M^s = M_0$$

$$L^d = L_0 + L_1 Y - L_2 r$$

where C is the private consumption, I is the private investment, G is the government spending, T is tax, M^s is the level of money supply, L^d is the level of real money demand, and r is the level of nominal interest rate. Suppose that price is fixed equal to 1. All the coefficients are non-negative.

- Discuss about the nature of government behavior. Does the assumption over the behavior of government make sense in practice?
- Derive the IS equation. Interpret the meaning of the IS equation. Discuss about the key relation derived from IS equation.
- Calculate the slope of IS curve. When is the IS curve flat? What does the flat IS curve imply about the sensitivity of real GDP to the interest rate?
- Use the IS equation and calculate the tax multiplier. How does the tax multiplier depend on slope of IS curve?
- Derive the LM equation. Interpret the meaning of the LM equation. Discuss about the key relation derived from LM equation.
- Calculate the slope of LM curve. When is the LM curve flat? What does the flat LM curve imply about the sensitivity of interest rate to the real GDP?
- Write both IS and LM equations in terms of the matrix representation.
- Solve for the equilibrium GDP and interest rate (Y^*, r^*) using the Cramer's rule. (*Caution*: you will get **ZERO** if you don't use the Cramer's rule.)
- Calculate the multiplier of G_0 and the multiplier of M_0 on both Y^* and r^* , respectively. Discuss whether the multiplier is bigger or smaller than the case that government spending is purely exogenous, i.e. $G_1 = 0$.

The government is seeking for some advices on fiscal and monetary policy implementation. The goal of the government is to (i) *increase the real GDP (Y) by \$100*, while (ii) *keeping the current*

level of interest rate stayed the same. (That is, the government was thinking that the country is running into an unemployment situation, but the level of interest rate is now optimal.) Following the storyline given here and all your work that you have done before, answer the next two questions.

- j. (hard) Can the government successfully achieve both goals by simply relying on *a single type of policy implemented?* That is, to achieve the two goals, would it work to either change the *government expenditure* or *money supply*, but not both at the same time? If yes, *under which conditions?*
- k. (hard) If the condition that you assumed in “j” does not hold, what would you recommend to the government so that both goals can be simultaneously achieved? (Hint: think about an appropriate mixture of the two policies.)

Good Luck!

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