

**Problem Set 2**

Due in Lecture on Monday, October 24. "Box-in" your answers to the algebraic questions.

**1. Expenditure switching versus expenditure reduction**

<u>Eq.No.</u>	<u>Equation</u>	<u>Description</u>
(1)	$Y = AD$	Output equals aggregate demand – an equilibrium condition
(2)	$AD \equiv C + I + G + EX - IM$	Definition of aggregate demand
(3)	$C = \overline{C\overline{O}} + c(Y - T)$	Consumption function, $c$ is the marginal propensity to consume
(4)	$T = \overline{T\overline{A}} + tY$	Tax function; $\overline{T\overline{A}}$ is lump sum taxes, $t$ is tax rate.
(5)	$I = \overline{I\overline{N}}$	Investment function
(6)	$G = \overline{G\overline{O}}$	Government spending on goods and services
(7)	$EX = \overline{EX\overline{P}} + vq$	Export spending
(8)	$IM = \overline{IM\overline{P}} + mY - nq$	Import spending

Equilibrium income,  $Y_0$ , is given by:

$$(9) \quad Y_0 = \left( \frac{1}{1 - c(1 - t) + m} \right) [\overline{A} + \overline{EX\overline{P}} - \overline{IM\overline{P}} + (n + v)q] \quad \text{let } \overline{\alpha} \equiv \left( \frac{1}{1 - c(1 - t) + m} \right)$$

1.1 Solve for the total differential (break the change in  $Y$  into its constituent parts).

1.2 Calculate the change in the trade balance given a \$1 (billion) increase in government expenditures.

1.3 Calculate the change in the trade balance given a one unit change in the real exchange rate (a one unit depreciation of the real value of the dollar). Remember: GDP responds to a change in the real exchange rate,  $q$ .

1.4 If the marginal propensity to import rises, then what is true about the relative effectiveness of expenditure switching versus expenditure reducing as a means of reducing a trade deficit?

**2. Fiscal policy in an IS-LM model**

Suppose the real side of the economy is given by:

(1)	$Y = AD$	Output equals aggregate demand – an equilibrium condition
(2)	$AD \equiv C + I + G + EX - IM$	Definition of aggregate demand
(3)	$C = \overline{C\overline{O}} + c(Y - T)$	Consumption function, $c$ is the marginal propensity to consume
(4)	$T = \overline{T\overline{A}} + tY$	Tax function; $\overline{T\overline{A}}$ is lump sum taxes, $t$ is tax rate.
(5')	$I = \overline{I\overline{N}} - bi$	Investment function
(6)	$G = \overline{G\overline{O}}$	Government spending on goods and services
(7)	$EX = \overline{EX\overline{P}} + vq$	Export spending
(8)	$IM = \overline{IM\overline{P}} + mY - nq$	Import spending

and the monetary sector is given by:

<u>Eq.No.</u>	<u>Equation</u>	<u>Description</u>
(10)	$\frac{M^d}{P} = \frac{M^s}{P}$	Equilibrium condition
(11)	$\frac{M^s}{P} = \frac{\bar{M}}{P}$	Money supply
(12)	$\frac{M^d}{P} = kY - hi$	Money demand

For now, we ignore the external balance condition.

- 2.1 Solve for the IS curve, with  $Y$  on the left hand side. Show your work.
- 2.2 Solve for the LM curve, with  $i$  on the left hand side. Show your work.
- 2.3 Graph the IS and LM curves on a single graph. Show the vertical intercepts, the slopes, and the intersection.
- 2.4 Solve for equilibrium income. Show your work.
- 2.5 Calculate the change in income resulting from a given increase in lump sum taxes,  $\Delta TA$ .
- 2.6 Show graphically what happens when lump sum taxes are increased. Clearly indicate the distance of the curve shifts, and the amount of the income change.
- 2.7 Is the effect of lump sum taxes on income greater or less in this model, as compared to the simple Keynesian model? Explain why the difference occurs, in words.
- 2.8 Answer 2.7 again, if the interest sensitivity of money demand were infinite. Explain why this is true.
- 2.9 Answer 2.7 again, if the interest sensitivity of investment were infinite. Explain why this is true.

### 3. Monetary policy in an IS-LM model

Using the model laid out in Question 2,

- 3.1 Calculate the change in income for a given change in money supply,  $\Delta(M/P)$  (you can assume that the price level  $P$  is fixed at 1).
- 3.2 Show graphically what happens when the real money stock is decreased. Clearly indicate the distance of the curve shifts and the amount of the income change.
- 3.3 Suppose instead that the interest sensitivity of investment were very high. Show graphically the effect upon output and interest rates that result from an increase of the real money stock. Clearly indicate the distance of the curve shifts and the amount of the income change.
- 3.4 Suppose the interest sensitivity of money demand was infinite. Show graphically the effect upon output and interest rates that result from an increase of the real money stock. Clearly indicate the distance of the curve shifts and the amount of the income change.

### 4. Policy under Fixed Exchange Rates

Suppose the economy is given by the following set of equations.

$$(1) \quad Y = \bar{\alpha}[\bar{A} + \overline{EXP} - \overline{IMP} + (n + v)q - bi] \quad \text{<IS curve>}$$

$$(1') \quad \boxed{i = \frac{\bar{A} + \overline{EXP} - \overline{IMP} + (n + v)q}{b} - \left( \frac{1 - c(1 - t) + m}{b} \right) Y} \quad \text{<IS curve>}$$

$$(2) \quad \boxed{i = -\left(\frac{1}{h}\right)\left(\frac{M}{P}\right) + \left(\frac{k}{h}\right)Y} \quad \text{<LM curve>}$$

$$(3) \quad \boxed{i = -\left(\frac{1}{\kappa}\right)[(\overline{EXP} - \overline{IMP} + \overline{KA}) + (n + v)q] + \bar{i}^* + \left(\frac{m}{\kappa}\right)Y} \quad \text{<BP=0 curve>}$$

4.1 Draw a graph of initial equilibrium, where the goods and money markets are in equilibrium, as is the balance of payments. Assume that  $m/\kappa < k/h$ .

4.2 Show what happens if the government cuts the *tax rate*, both immediately, and over time, assuming no sterilization.

4.3 At the new equilibrium, what is true about (i) the level of output; (ii) the level of investment; (iii) the real exchange rate; and (iv) the trade balance.

4.4 Redraw 4.1, and show the impact of a monetary contraction, both immediately and over time. Assume over time, capital flows are sterilized.

4.5 Explain why the process you lay out in 4.4 occurs.

4.6 Answer 4.4 if capital flows are not sterilized.

4.7 Does your answer to 4.5 change if  $m/\kappa > k/h$ ?

## 5. Policy under Floating Exchange Rates

5.1 Now assume the economy you depicted in 4.1 is under a floating exchange rate regime. Show what happens if the government cuts government spending.

5.2 Explain your answer to 5.1.

5.3 Now examine a monetary expansion from initial equilibrium, carefully distinguishing between initial impact, and the effect over time.

5.4 Explain why monetary policy has a larger effect in this open economy as opposed to that in a closed economy.