

### Problem Set 2

Due *in lecture* on Monday, February 20th. Be sure to put your name on your problem set. Put “boxes” around your answers to the algebraic questions.

1. Suppose the economy is described by the following equations (so we are looking at a closed economy):

• Real Sector

- |     |                           |   |
|-----|---------------------------|---|
| (1) | $Y = Z$                   | Output equals aggregate demand, an equilibrium condition    |
| (2) | $Z = C + I + G$           | Definition of aggregate demand                              |
| (3) | $C = c_o + c_1 Y_D$       | Consumption fn, $c_1$ is the marginal propensity to consume |
| (4) | $Y_D \equiv Y - T + Tr$   | Definition of disposable income                             |
| (5) | $T = t_1 Y$               | Tax function; $t_1$ is marginal tax rate.                   |
| (6) | $Tr = TR_0 - \lambda Y$   | Transfer payments; $TR_0$ is lump sum transfers.            |
| (7) | $I = b_0 + b_1 Y - b_2 i$ | Investment function   |
| (8) | $G = GO_0$                | Government spending on goods and services, exogenous        |

• Asset Sector

- |      |                                  |                       |
|------|----------------------------------|-----------------------|
| (9)  | $\frac{M^d}{P} = \frac{M^s}{P}$  | Equilibrium condition |
| (10) | $\frac{M^s}{P} = \frac{M_0}{P}$  | Real money supply     |
| (11) | $\frac{M^d}{P} = \mu_0 + Y - hi$ | Real money demand     |

- 1.1 Solve for the IS curve ( $Y$  as a function of  $i$ ).
- 1.2 Solve for the LM curve ( $i$  as a function of  $Y$ ). What is the channel by which monetary influences affect the real goods sector in this model?
- 1.3 Solve for the equilibrium values of  $Y$ .
- 1.4 Graph the IS and LM curves on one diagram. Clearly indicate the intercepts and the slopes.
- 1.5 What are the exogenous and endogenous variables?
- 1.6 What is the government spending multiplier? What is the monetary policy multiplier?

2. Suppose the equations in the model above assume the following values:

$$c_o = 1000; c_1 = 0.8 \qquad t_1 = 0.20 \qquad TR_0 = 800; \lambda = 0.05; GO_0 = 600$$

$$b_0 = 2000; b_1 = 0; b_2 = 10 \qquad h = 100; \mu_0 = 200 \qquad M_0 = 10000; P_0 = 1$$

- 2.1 Calculate the equilibrium values of  $Y$ ,  $i$ , and  $I$  (call them  $Y_0$ ,  $i_0$ , and  $I_0$ , respectively).
- 2.2 Assume  $G$  increases to 1100, and is completely bond financed (no portfolio effects here). Calculate the new level of income,  $Y_1$ , and hence calculate the numerical value of the government spending multiplier,  $\Delta Y / \Delta GO$  (OR calculate  $\Delta Y / \Delta GO$  and then find  $Y_1$ ).

2.3 Calculate how much *investment* has changed by the increase in  $G$ . What is the amount of investment “crowded out” by higher interest rates? Explain the crowding out *briefly* using words and a graph.

2.4 Suppose the  $G$  remains at 600, but  $M/P_0$  increases to 20500. Calculate the new equilibrium  $Y$  and  $i$  (call them  $Y_2$  and  $i_2$ ).

2.5 Calculate the monetary policy multiplier,  $\Delta Y/\Delta(M/P)$ .

3. Suppose that  $G$  is increased to 1100, and  $M/P_0$  is also increased to 20500 (so that the fiscal policy is money-financed).

3.1 What is the new equilibrium  $Y$  and  $i$  (call them  $Y_3$  and  $i_3$ )?

3.2 What is the new level of investment (call it  $I_3$ )? Relative to what happens in question 2.3, why is the change in investment different in this case?

4. Using the algebraic model provided in question 1, draw the IS-LM diagrams for the following situations:

4.1 Money demand is very insensitive to the interest rate.

4.2 Investment is very sensitive to the interest rate.

4.3 The marginal tax rate is very high.