

**Problem Set 1**

Due *in lecture* on Wednesday, September 23. 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) | $Tr = TR_0$               | 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 LM curve ( $i$  as a function of  $Y$ ).
- 1.2 Solve for the IS curve ( $Y$  as a function of  $i$ ).
- 1.3 What is the channel (or variable) by which factors in the monetary or asset sector affect the real goods sector in this model?
- 1.4 Solve for the equilibrium value of  $Y$ .
- 1.5 Graph the IS and LM curves on one diagram. Clearly indicate the intercepts and the slopes. Label the equilibrium income and interest rate  $Y_0$  and  $i_0$ .

- 2.1 Assume  $G$  decreases by  $\Delta GO$ , and is completely bond financed (no portfolio effects here). Calculate the government spending multiplier.
- 2.2 Suppose instead  $Tr$  decreases by  $\Delta TR$ . Calculate the government transfers multiplier.
- 2.3 Redraw your answer to 1.5. Then in the same graph, show what happens to the equilibrium income and interest rate if government spending on goods and services is decreased by  $\Delta GO$ . Include in your graph the level of income that would be achieved if somehow the interest rate stayed constant (label this point  $Y_A$ ).

2.4 At the new equilibrium, do we know if investment is higher or lower than the level it started out with? Do we know if it is higher or lower than at  $Y_A$ ?

2.5 Suppose the Fed targets the interest rate at  $i_0$  (call this  $i_{target}$ ). Returning to 2.3, show graphically what happens if government is decreased. What happens to the level of investment?

3. Consider the Aggregate Demand-Aggregate Supply framework. Suppose government spending is increased when we are in a liquidity trap, and the Fed does **NOT** target the interest rate. You can assume for simplicity expected inflation is always zero.

3.1 Show what happens in an IS-LM and AD-AS graph in the period the government spending increase occurs, and output ends up below potential GDP, and remains in a liquidity trap.

3.2 Show what happens over time to output, the price level, and the interest rate.

3.3 Show what happens in an IS-LM and AD-AS graph in the period the government spending increase occurs, and output ends up above potential GDP, and out of a liquidity trap.

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