

**Problem Set 1** (rev'd)

Due *in lecture* on Wednesday, September 28. 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 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 value of  $Y$ .

1.4 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  $G$  increases by  $\Delta GO$ , and is completely bond financed (assume no portfolio effects here). Calculate the government spending multiplier.

2.2 Suppose instead  $Tr$  increases by  $\Delta TR$ . Calculate the government transfers multiplier.

2.3 Redraw your answer to 1.4. Then in the same graph, show what happens to the equilibrium income and interest rate if government ~~spending on goods and services~~ **transfers** is increased by  $\Delta TR$ . 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  $i_{\text{target}}$ ). Returning to 2.3, show graphically what happens if government is increased. What happens to the level of investment?

3. Consider the case where the economy is in a liquidity trap.

3.1 Draw an IS-LM graph corresponding to this case.

3.2 Show what happens if business owners become more pessimistic, such that the autonomous component of investment declines.

3.3 What happens to tax revenues in 3.2? If the budget were initially in balance, what happens to the budget deficit?

3.4 Suppose policymakers wish to improve the budget balance. Would an increase in lump sum taxes accomplish that aim? What would happen to GDP?

4. Consider the Aggregate Demand-Aggregate Supply framework. Suppose government spending is reduced when we are not in a liquidity trap (and do not end up in a liquidity trap), and the Fed does **NOT** target the interest rate. You can assume for simplicity expected inflation is always zero.

4.1 Show what happens in an IS-LM and AD-AS graph in the period the government spending reduction occurs.

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

4.3 Show what the IS-LM and AD-AS graphs look like if initially, the economy is not in a liquidity trap, but interest rates are very close to zero, and output is below potential GDP/full employment. Re-answer 4.1, assuming the economy does end up in a liquidity trap.

5.1. Look up on the WSJ or Bloomberg the yield on (as close as possible to) a one year T-bill. Calculate the price as if the bond were to mature one year from now (specify the date you looked up the data). Show your calculations.

5.2 Once again, look up the one year and two year yields. Assuming the expectations hypothesis of the term structure holds, what is the expected interest one year interest rate, one year from today. Show your calculations.

5.3 Draw the yield curve, for 3 months to 30 years (at 3, 6, 12 months, 2, 5, 10, 30 years)