

Problem Set 1

Due *in lecture* on Monday, February 25. 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

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|-----|---------------------|---|
| (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) | $Y_D \equiv Y - T$ | Definition of disposable income |
| (5) | $T = t_0 + t_1 Y$ | Tax function; t_1 is marginal tax rate. |
| (6) | $I = b_0 - b_2 i$ | Investment function |
| (7) | $G = GO_0$ | Government spending on goods and services, exogenous |

• Asset Sector

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|------|----------------------------------|-----------------------|
| (8) | $\frac{M^d}{P} = \frac{M^s}{P}$ | Equilibrium condition |
| (9) | $\frac{M^s}{P} = \frac{M_0}{P}$ | Real money supply |
| (10) | $\frac{M^d}{P} = \mu_0 + Y - hi$ | 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 ΔGO , and is completely bond financed (no portfolio effects here). Calculate the government spending multiplier.
- 2.2 Suppose instead t_0 changes by $\Delta t_0 < 0$ Calculate the government lump sum taxes 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 lump sum taxes changes by Δt_0 . 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 lump sum taxes are decreased. What happens to the level of investment?

3. Consider the Aggregate Demand-Aggregate Supply framework. Suppose lump sum taxes are decreased 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.

3.1 Show what happens in an IS-LM and AD-AS graph in the period the lump sum taxes decrease occurs.

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

3.3 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. Then show what happens if potential GDP shifts out *a lot* because entrepreneurs develop new products due to tax rate reductions and deregulation.

4.1. Look up on Bloomberg, *WSJ*, or elsewhere the yield on 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.

4.2 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.

4.3 Draw (do not download) the yield curve, for 3 months to 30 years (look up the values for 3 months, and 1, 2, 5, 10, 30 years).

4.4 Assuming the expectations hypothesis of the term structure holds (i.e., there is no liquidity premium), do you expect the US economy to go into recession in the next year, based on the data you have plotted? Why or why not?