Problem Set 1 (rev'd 9/23)

Due on 5:30pm CDT Friday, September 25 by submission to Canvas. 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)	$Y_D \equiv Y - T$	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

(8)	$\dfrac{M^d}{P} = \dfrac{M^s}{P}$	Equilibrium condition
(9)	$\dfrac{M^s}{P} = \dfrac{M_0}{P}$	Real money supply
(10)	$\dfrac{M^d}{P} = \mu_0 + Y - hi$	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 (and there are no portfolio effects here). Calculate the government spending multiplier.
2.2 Suppose instead t_0 decreases by Δt_0. Calculate the lump sum tax 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 are cut 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 at? 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 is decreased. What happens to the level of investment?

2.6. Return to 2.3. Show graphically what happens if the marginal tax rate, t_1, is reduced.

3. Consider a situation where the economy is in a liquidity trap.
3.1 Draw a diagram illustrating the situation where interest rates are at the zero lower bound.
3.2 Show what happens to the equilibrium income and interest rate if the money supply is increased.
3.3 Show what happens if lump sum taxes are decreased. Does investment rise or fall?

4. Consider an economy where the money demand function takes the following form:

$$\frac{M^d}{P} = \mu_0 + Y + j\left(\frac{MB}{P} + \frac{B}{P}\right) - hi$$

Assume investment depends on income and the interest rate, and the marginal tax rate is zero.

4.1 Further assume the budget is balanced to begin with. When taxes are cut by Δt_0, the government must borrow $\Delta(B/P)$. What happens to the LM curve when lump sum taxes decrease? Why?
4.2 Can you tell what happens to equilibrium income and interest rates when lump sum taxes decrease? Show, using and IS-LM diagram.
4.3 What happens to investment? Explain, using an equation.
4.4 Assume the Fed targets the interest rate at the level it was before the decrease in lump sum taxes. What is the impact on equilibrium income and interest rates of the ~~increase in government spending~~ decrease in lump sum taxes?