# Economics 227: Intermediate Macroeconomics
Problem Set #5 Answers

1. Consider the two exogenous shocks to the economy below. Determine what happens to consumption, investment, the interest rate, GDP, and national saving in the long run. Then determine what happens to these variables in the short run. Show that with flexible prices, the economy will eventually converge to the long run equilibrium.

   All of your answers should include an IS/LM diagram.

   (a) Autonomous consumption spending c_0 falls.

   In the LR, national savings rises, so r falls, stimulating investment spending. GDP is unchanged, since $Y = F\left(\overline{K}, \overline{L}\right) = \overline{Y}$, all the goods previously consumed are instead used for investment:
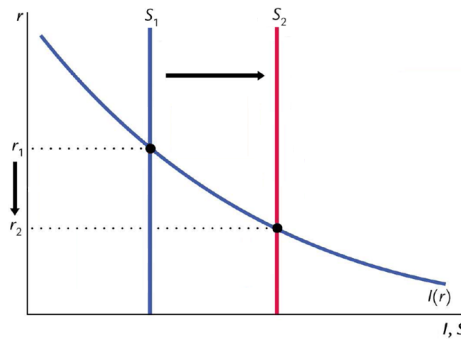
   In the SR, the IS curve shifts to the left. r falls, so $I = I(r)$ rises, but by less than the drop in C because Y has fallen. Since $Y < \overline{Y}$, prices will start to fall, shifting out the LM curve. Prices will continue falling until we return to the long run equilibrium at $\overline{Y}$. At $\overline{Y}$, the change in C and I is exactly the same as the change given by the long run model.

   (b) The government increases spending and taxes by the same amount.

   In the LR model, national savings falls, like in earlier exercises. There's no change in Y, r rises, and both $C = C(Y - T)$ and $I = I(r)$ fall. Higher government spending is paid for both by reduced consumption and reduced investment.

   In the SR, the IS curve shifts out. An increase in spending by ΔG shifts the IS curve right by $\frac{\Delta G}{1-c_1}$. An increase in taxes by ΔT shifts the IS curve to the left by $\frac{-c_1 \Delta T}{1-c_1}$. So an increase in both spending and taxes by $\Delta G = \Delta T$ shifts the IS curve to the right by ΔG. Y and r increase, investment falls. Note that income rises by less than ΔT because of this crowding out. This means that disposable income $Y - T$ falls, so consumption falls.

   Since now $Y < \overline{Y}$, prices will fall over the LR, shifting out the LM curve. Prices continue falling until we return tot he long run equilibrium at $\overline{Y}$, where again the new values of C and I must be exactly the same as in the LR model.

   (c) The Central Bank increases the money supply.

In the LR model, we assume the quantity theory of money holds. There's no change in GDP, only prices rise at the same rate as the money supply. The the SR, the LM curve initially shifts out, so r falls and Y rises. Investment consumption and national savings rise. But because now $Y > \overline{Y}$, prices will rise over the LR, and continue rising until we return to exactly the same SR equilibrium as before. The only consequence is inflation, perfectly consistent with the LR model.

2. Suppose that the demand for real money balances depends on the interest rate and disposable income $Y - T$, so $\frac{M}{P} = L(r, Y - T)$. In the short run, can you determine the effect of a tax cut on C, I, Y, and r?

   A tax cut increases the demand for money, and therefore shifts the LM curve to the left. A tax cut also increases the demand for consumption spending, and therefore shifts the IS curve to the right. r necessarily rises (so $I(r)$ falls), But the change in Y is ambiguous, depending which curve shifts more. Since we can't determine the change in Y, the change in $C(Y - T)$ is also ambiguous.

3. Suppose that taxes are the following function of income: $T(Y) = t_0 + t_1 Y$. How does an increase in the tax rate t_1 affect the slope of the IS curve? How does this alter the effects of monetary and fiscal policy on Y in the short run? Explain.

   An increase in the tax rate makes the IS curve steeper. With higher taxes, the multiplier is smaller. The new multiplier is $\frac{1}{1-c_1(1-t_1)} < \frac{1}{1-c_1}$. Intuitively, each additional $1 of spending increases disposable income by only $\$(1 - t_1)$, because the government now confiscates a fraction t_1 of income as taxes. People spend a fraction c_1 of disposable income, so if I buy something from you for $1, you'll increase your spending by only $\$c_1(1 - t_1)$. The IS curve is the set of r, Y pairs at which the goods market is in equilibrium. Now a drop in r will stimulate investment spending, which increases income, which stimulates consumption: the additional investment spending sparks a multplier process to a new (higher) equilibrium Y in the goods market. With a smaller multiplier, the new equilibrium Y is smaller, so the IS curve is steeper.

   With a steeper IS curve, monetary policy becomes less effective — consider an LM curve shifting along an extremely steep IS curve.

4. Suppose the Central Bank announces that next year it will double the money supply. Does this announcement affect the economy today? How?

   People will expect higher inflation. Higher expected inflation shifts the IS curve to the right, so the interest rate and GDP rise.