Masters Macroeconomics Fall 2015
Homework Assignment #7 Due: 25 November

1. Explain why each of the following statements is true. Discuss the effects of monetary and fiscal policy on output in each of the cases.

a. If investment does not depend on the interest rate, the *IS* curve is vertical.
b. If money demand does not depend on the interest rate, the *LM* curve is vertical.
c. If money demand is extremely sensitive to the interest rate, the *LM* curve is horizontal.

2. For each of the three situations above, explain whether (1) monetary policy and (2) fiscal policy would have strong or weak effects on output. Be careful to think about whether the curves would shift left and right or up and down.

3. The central bank is considering two alternative monetary policies: (1) holding the money supply constant and letting the interest rate adjust to establish equilibrium, or (2) adjusting the money supply as necessary to hold the interest rate at a target level.

a. Which policy leads to more stable real output (in the short run with the price level fixed) if all shocks to the economy occur due to changes in the demand for goods and services? Show this on a graph.
b. Which policy leads to more stable real output (in the short run with the price level fixed) if all shocks to the economy occur due to changes in the demand for money? Show it on a graph.

4. We assume that the nominal rate of return on holding money is zero—money pays zero nominal interest. The nominal rate of interest on a bond is i. Assume that the expected rate of inflation is π^e.

a. What is the real rate of return r on a bond and why?
b. What is the real rate of return on money and why?
c. What is the difference between the rate of return on a bond and the rate of return on money? Is it the same whether you calculate using nominal returns or real returns?
d. What is the opportunity cost of holding money in terms of forgone interest, the nominal rate i or the real rate r?
e. Which interest rate belongs in the demand function for money?
f. Suppose that the nominal interest rate were zero. Would you want to hold any of your wealth in bonds or would you prefer all of it to be money? Why? What happens to the money demand curve as the nominal interest rate approaches zero?
g. During the Great Depression in the United States, prices were falling at about 5% per year and interest rates on safe assets such as short-term government bonds were less than 0.1%. If inflation was expected to continue at –5%, what was the (expected) real interest rate on these bonds? Given that long-run equilibrium real interest rates on safe assets tend to be in the range of 2–3%, were real interest rates high or low? How attractive was investment in real capital (plant and equipment) at these interest rates?

5. This problem examines the *long-run* equilibrium of an economy using *IS*/*LM* and *AS*/*AD*. The long-run aggregate-supply curve is vertical at the natural level of output: the level of output at which labor supply equals labor demand.

Suppose that the production function in the economy is

$$Y = A\left(5L - 0.0025L^2\right),$$

where A is an index of productivity. We shall assume initially that $A = 2$. With this production function, the marginal product of labor is

$$MPL = 5A - 0.005A \times L.$$

The supply of labor is given by

$$L^s = 55 + 5\frac{W}{P}.$$

Desired consumption and investment spending are

$$C = 400 + 0.6\left(Y - T\right) - 35r,$$
$$I = 350 - 25r.$$

Taxes and government spending are

$$T = 200,$$
$$G = 200.$$

Money demand is

$$\frac{M^d}{P} = 0.5Y - 2.5\left(r + \pi^e\right).$$

Finally, the expected rate of inflation is 2 and the nominal money supply is 1000.

a. What is the equation for the labor demand curve in this economy? (Remember that firms demand labor up to the level where $MPL = \frac{W}{P}$.)
b. At what real wage rate does labor demand equal labor supply? What is the equilibrium level of labor input L? What is the long-run equilibrium level of output Y?
c. Suppose that the level of productivity increased to $A = 3$. What would happen to the long-run equilibrium levels of the real wage, employment, and output? Explain these effects intuitively and using graphs. One might expect that a 50% increase in productivity from $A = 2$ to $A = 3$ would increase output by 50%. Is that what happens? Explain.
d. For any given level of output Y, find an equation that gives the equilibrium real interest rate r that clears the goods market—the value of r that makes total desired expenditures equal to the given value of Y. Your equation should have r on the left-hand side, Y on the

right-hand side, and no other variables. This is the equation for the *IS* curve. Use this equation with the long-run equilibrium value of Y from part b to determine the long-run equilibrium real interest rate. What are the levels of consumption and investment in long-run equilibrium?

e. For any given level of output Y, find an equation that gives the equilibrium real interest rate r that clears the asset market—the value of r for which the real demand for money equals the real supply of money. Again, your equation should have r on the left and Y on the right, with no other variables except P. This is the equation for the *LM* curve. Use this equation and the results of parts b and d to find the long-run equilibrium value of the price level P.

f. Now suppose that the central bank increases the money supply by 10% to 1100. What are the new long-run equilibrium values of output, employment, the real wage, the real interest rate, consumption, investment, and the price level? Is money "neutral" in the long run in this model? (Money is neutral if a change in the money supply changes all prices in equal proportion and leaves all real variables unchanged.)

g. Now suppose (with the money supply back at 1000) that the government increases its purchases to 250. What are the new long-run equilibrium values of output, employment, the real wage, the real interest rate, consumption, investment, and prices? What happens to consumption and investment as a result of the increase in government spending? Is "crowding out" complete in the long run in this model? Show what has happened in the *IS*/*LM* diagram.