Economics 304 Fall 2009

Homework Set #5 Solutions

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1. Suppose that the demand for money (holding income and prices constant since we are not going to be concerned with them) is $M = 200 - 10i$, where i is measure in percentage points (i.e. 2, not 0.02). Households desire a currency/deposit ratio of 1/9 and banks want to hold 1/9 of their deposits in the form of reserves.

a. What is the money-supply multiplier?

The money-supply multiplier is $M / B = (1 + CU) / (R + CU)$ = (10/9) / (2/9) = 5.

b. If the equilibrium interest rate is 5%, what must the money supply and the monetary base be?

If the interest rate is 5, then the money supply is 200 – 50 = 150 and the monetary base must be 1/5 of that, or 30.

c. Assuming that the currency/deposit ratio and reserve/deposit ratio do not depend on the interest rate, what is the "derived demand" equation for the monetary base? [Hint: this is tricky. You might start by determining separate demand equations for deposits and currency, given the public's desired distribution of total money held. Then determine a demand for reserves based on the demand for deposits and banks' desired reserve ratio.]

There are two ways to go at this. One is to note that (with the given values of the ratios) the base is 1/5 of the money supply, so the demand for the base is 1/5 (200 – 10i) = 40 – 2i. The more complex, but informative, way is to follow the hint and note that the public demands 9/10 of its money in the form of deposits and 1/10 in currency, so the demand for deposits is 180 –9i and the demand for currency is 20 – i. Banks demand 1/9 of deposits in reserves, so the demand for reserves is 1/9 (180 – 9i) = 20 – i. The total demand for the base is the sum of the currency and reserve demands (which happen to be identical here), or 40 –2i.

d. Graph this demand equation with the base on the horizontal axis and the interest rate on the vertical axis. Show the initial point of equilibrium.

Your demand curve should be a straight line intersecting the horizontal (B) axis at 40 and the vertical (i) axis at 20. The equilibrium is at (30, 5).

e. Show in equations and on your graph what would happen to the demand for the monetary base if banks' reserve ratio were to double.

A doubling of the reserve ratio would increase the demand for reserves to $40 - 2i$ and the demand for the base to $60 - 3i$. It would shift the base-demand curve out to intersect the B axis at 60, with the vertical intercept unchanged at 20.

f. What would happen to the interest rate and the money supply if the central bank held the base constant when the reserve ratio increased?

If the base stays at 30, then the interest rate must increase to 10% so that the demand for the base is equal to supply at $30 = 60 - 3(10)$. The money-supply multiplier becomes $(10/9) / (3/9) = 10/3$, and the money supply becomes $200 - 10(10) = 100 = (10/3)\ 30$.

g. What would happen to the base and the money supply if the central bank held the interest rate constant when the reserve ratio increased?

If the central bank holds the interest rate at 5%, then it must increase the base to $60 - 3(5) = 45$ as the demand for reserves increases. This will keep the money supply constant at $200 - 10(5) = 150 = (10/3)\ 45$.

h. Which of the above policies would more effectively preserve macroeconomic stability in the face of a shock to bank reserve-holding behavior?

The latter policy would insulate the economy from a decrease in the money supply and avoid contractionary pressure.

2. Suppose that we change the Keynesian multiplier model of Section 10.2 by recognizing that the amount of taxes collected depends on aggregate income. Let $T = tY$, where t is the tax rate and is set exogenously by the government. Derive a new formula for the multiplier using the methods in Box 10.1 and Box 10.2. Is the multiplier larger or smaller than when taxes are fixed? Why?

An increase in Y now raises taxes. The increase in absorption resulting from an increase in Y must now be

$$\frac{\Delta A}{\Delta Y} = \frac{\Delta C}{\Delta (Y - T)} \frac{\Delta (Y - T)}{\Delta Y} = c(1 - t).$$

Thus the multiplier will be $c\ (1 - t)\ (1 - z)$. This is smaller than when taxes are fixed by a factor of one minus the tax rate. At each stage of the multiplier cycle, the increase in consumption that is cycled back into aggregate demand is reduced by the increase in taxes.

3. Describe the difference in the assumptions about central-bank behavior that are embodied in the *LM* curve and the *TR* curve. Which one seems more realistic? Which one seems more desirable and why?

In the *LM* curve theory, the central bank fixes the money supply and allows interest rates to be determined by the market. In the *TR* theory, the central bank sets a target for the interest rate based on current economic conditions (output gap and inflation) and allows the money supply to be whatever *M* will yield that interest rate. The latter policy is followed by more central banks today than the former, though this has not always been the case. The results of problem one show why the interest-rate-pegging policy can be more desirable than the money-supply-pegging policy: it better stabilizes the economy when shocks hit the monetary system. However, the opposite is true for shocks to the spending side of the economy (*IS* curve), so which is more desirable just depends on what kind of shocks predominate.

4. How (if at all) would each of the following shift the *IS, LM,* and/or *TR* curves? Explain your answers and show the effect that the change would have on equilibrium output and the interest rate.

a. An increase in income taxes (assuming that Ricardian equivalence does not hold perfectly).

IS←, *Y*↓, *i*↓

b. An increase in income taxes (assuming that Ricardian equivalence does hold perfectly).

No change.

c. An increase in the monetary base (not *TR*).

LM→, *Y*↑, *i*↓

d. An increase in inflation (not *LM*).

TR↑, *Y*↓, *i*↑

e. An increase in banks' reserve/deposit ratio as in the previous problem.

LM←, *Y*↓, *i*↑, OR no change if central bank follows *TR* policy

f. A fall in the expected profitability of future capital.

q↓ → *IS*←, *Y*↓, *i*↓

g. An increase in the popularity of U.S. goods abroad due to a fall in the exchange rate.

IS→, *Y*↑, *i*↑

h. A decline in expected future income due to forecasts of a recession.

IS←, *Y*↓, *i*↓

i. A decrease in the demand for money due to the spread of ATMs.

LM→, *Y*↑, *i*↓, OR no change if central bank follows *TR* policy

5. Based on the model of Chapter 10, how would a recession in Europe affect the U.S. economy? Use graphs to demonstrate your answer. (Note that we will refine this answer in subsequent chapters.)

A recession in Europe would lower foreign absorption, which would reduce the demand for U.S. goods. This would shift the *IS* curve to the left and lower both U.S. output and interest rates.

6. The Solow model and the *IS*/*LM* (or *IS*/*TR*) model both discuss the determination of real GDP. They are very different. Does it make sense to have two completely different theories explaining the same variable? Discuss.

The Solow model is based entirely around aggregate supply—how much can the economy produce at any particular time with its resources and technology? The Keynesian model is based on aggregate demand—how much of the economy's goods do people want to buy? In the long run, prices and wages tend to keep demand in line with supply, so that the overall level of output is determined by production capacity. But in a recession situation, firms are often unable to sell their optimal amount of output, so demand might be the constraining factor. Thus, the Solow model is better for determining the long-run performance of an economy that is usually at or near full employment; the Keynesian model may be better in the short run if demand falls below capacity.

7. Describe how the preferences of central banks affect the slope of the *TR* curve. What would the *TR* curve look like for an "inflation hawk" central bank that worried most about inflation? What would the *TR* curve look like for a central bank that was more focused on stabilizing business cycles? Explain.

A central bank that was an inflation hawk would shift its *TR* curve upward strongly with any increase in inflation. It would also tend to have a flatter *TR* curve because it would respond less to changes in output. A central bank that worried about countering changes in output to maintain full employment would have a steep *TR* curve—interest rate would fall rapidly as output drops a little below capacity.