Economics 201 | Fall 2010
Introduction to Economic Analysis | Jeffrey Parker
Problem Set #8 | Due: Wednesday, December 8

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1. Suppose that in the closed economy of Keynesia, consumption is given by

$$C = 100 + 0.75(Y - T).$$

Planned investment I is constant at 200, government purchases G are 160, and the government's budget is balanced so $G = T$. Aggregate supply responds passively to changes in demand, so $Y = C + I + G$.

a. What is the marginal propensity to consume?

The MPC is $\Delta C/\Delta Y$ from the consumption function, which is 0.75.

b. Use algebra to find the equilibrium value of Y, the equilibrium level of income?

We start from $Y = C + I + G$, then substitute in the consumption function for C and the levels of I, G, and T to get

$$\begin{aligned} Y &= 100 + 0.75(Y - 160) + 200 + 160 \\ &= 100 - 120 + 200 + 160 + 0.75Y \\ &= 340 + 0.75Y. \end{aligned}$$

Bringing the Y term to the left gives us

$$\begin{aligned} Y - 0.75Y &= 340 \\ 0.25Y &= 340 \\ Y &= 340 / 0.25 = 1360. \end{aligned}$$

c. If government spending rises to 180 with no change in taxes, what will happen to the Keynesian equilibrium level of income? What is the government-expenditure multiplier $\frac{\Delta Y}{\Delta G}$? Does this value agree with the formula in Chapter 21?

If the value of G increases to 180, then the 340 on the right-hand side becomes 360 and, after dividing by 0.25, the new value of Y is 1440. Y has gone up by 80, so the multiplier is 80/20 = 4, which agrees with the Chapter 21 formula 1/(1–MPC) = 1/0.25 = 4.

d. If taxes increase to 180 with no change in government spending, what will happen to income? What is the tax multiplier $\frac{\Delta Y}{\Delta T}$?

Putting G back at 160 and increasing T to 180, lowers the 340 on the right-hand side to 325 because the tax value is multiplied by the MPC of 0.75. Carrying through the arithmetic yields Y = 1300. The tax multiplier is thus –60/20 = –3.

e. If both government spending and taxes increase to 180, will equilibrium income change? Explain this result intuitively.

Income increases from 1360 to 1380. This happens because the government-spending multiplier is larger than the absolute value of the tax multiplier, which occurs in turn because the effect of taxes is multiplied by the MPC but the effect of government spending is not. Intuitively, every dollar of government spending is actually spent, whereas each additional dollar of taxes cuts spending by only 75 cents because some of the additional taxes will be paid out of saving rather than by cutting back spending.

2. Starting with the same consumption function and government values as in the previous problem, suppose that investment in Keynesia is given by

$$I = 285 - 10r,$$

where r is the real interest rate in percentage points. Suppose that the real money demand function is

$$\frac{M^d}{P} = 0.8Y - 80r.$$

The nominal money supply is initially 800 and the price level is 1.

a. Why is M/P the "real" demand for money? What is the rationale behind this money-demand specification?

M/P measures the real purchasing power of the stock of money: the number of dollars held divided by the price of a market basket of goods = the number of market baskets that can be bought with the total money stock.

Money demand should be in real terms because what matters to people is the purchasing power of their money, not the number of dollars. A change in the price level would change the nominal demand for money proportionally. The higher the level of real income, the more transactions people are making so the more money they need, so Y enters with a positive sign. The interest rate is the opportunity cost of holding money (forgone interest on other assets), so the higher the interest rate is the less money people want to hold.

b. What interest rate balances the demand for money with the supply of money when output is 1200? When output is 1500? When output is 1800? Explain intuitively why this relationship between output and the equilibrium interest rate in the "money market" slopes the way that it does.

If $Y = 1200$, $M = 800$, and $P = 1$, then equilibrium in money holding requires that $800 = 0.8 \times 1200 - 80r$. Solving yields $r = 2$. When $Y = 1500$, similar calculations yield $r = 5$ and when $Y = 1800$, the equilibrium $r = 8$. The equilibrium relationship between r and Y (which is often called the LM curve) is $r = -10 + 0.01Y$. It slopes upward because an increase in income raises the real demand for money, requiring a rise in the interest rate to rebalance demand with unchanged supply.

c. Given the investment and money-demand functions, together with the consumption function and government budget variables from the previous problem, what are the equilibrium interest rate and equilibrium level of output?

We begin by plugging into the $Y = C + I + G$ equation again.

$$\begin{aligned} Y &= 100 + 0.75(Y - 160) + 285 - 10r + 160 \\ Y &= 425 + 0.75Y - 10r \\ Y - 0.75Y &= 425 - 10r \\ 0.25Y &= 425 - 10r \\ Y &= 1700 - 40r. \end{aligned}$$

This negatively sloped relationship is usually called the IS curve. We can combine it with the LM curve that we derived in part b to get the equilibrium levels of Y and r:

$$\begin{aligned} Y &= 1700 - 40r \\ &= 1700 - 40(-10 + 0.01Y) = 2100 - 0.4Y \\ Y + 0.4Y &= 2100 \\ Y &= 2100 / 1.4 = 1500. \end{aligned}$$

With $Y = 1500$, we derived in part b that $r = 5$.

d. Suppose that government spending were to increase to 180. How would this affect the interest rate and real output? How does this compare with the multiplier derived above when investment was held constant? What is the intuition behind this difference?

In the IS curve calculation from part c, the 425 would now be 445, leading to $Y = 1780 - 40r$. This reflects the fact that if the interest rate were to remain unchanged, output would increase by the full multiplier effect of $4 \times 20 = 80$. However, the increase in output will be smaller when we allow the interest rate to change. The intuition is crowding out: as income grows, the demand for money increases forcing the interest rate up, which lowers investment spending offsetting some of the expansionary effects of the increase in G.

Combining the new IS curve with the LM curve,

$$\begin{aligned} Y &= 1780 - 40(-10 + 0.01Y) \\ Y + 0.4Y &= 2180 \\ Y &= 2180 / 1.4 = 1557.1. \end{aligned}$$

The new equilibrium interest rate is $r = -10 + 0.01Y = 5.571$.

When crowding out is taken into account, the government spending multiplier falls from 4 to $57.1/20 = 2.86$.

e. Treating P as a variable, find the equation for the aggregate-demand curve relating Y to P when $G = T = 160$, and $M = 800$.

This returns to the calculation of part c, except we have to keep P as a variable rather than substituting in the value 1. In the LM curve, $800/P = 0.8Y - 80r$, so $r = -10/P + 0.01Y$, which reduces to the equation we derived above when $P = 1$. Substituting this into the IS equation gives

$$\begin{aligned} Y &= 1700 - 40(-10/P + 0.01Y) \\ &= 1700 + 400/P - 0.4Y \\ Y + 0.4Y &= 1.4Y = 1700 + 400/P \\ Y &= 1214.3 + 285.7/P. \end{aligned}$$

This equation is downward-sloping but not linear.

3. The current macroeconomic situation features nominal interest rates near zero, high unemployment, lagging GDP recovery after a steep recession, and low inflation.

a. Do you think expansionary policy actions are appropriate? (Remember that policy actions often take 1–3 years before they have their full effect on the economy.)

Your answer may differ, but the slow recovery with low inflation makes conditions conducing to expansionary policy.

b. If expansion is appropriate, which is the more promising policy lever to use under today's conditions, monetary policy or fiscal policy? Why?

Monetary policy is limited by the fact that nominal interest rates cannot fall much. Fiscal policy has much more scope for effectiveness because with interest rates so low, the likelihood of crowding out is small. However, expansionary fiscal policy would raise an already scary government deficit situation to even higher levels. A difficult decision.