Exercise in the class (2009-10-06)

The IS-LM Model and Economic Policy

Consider an economy characterized by the following equations:

$C = 120 + 0.3\ Y_d$

$I = 0.2Y - 1{,}500i$

$G = 200$

$T = 150$

$\frac{M^d}{P} = 0.6Y - 1{,}200i$

$\frac{M^s}{P} = 90$

where investment is endogenous.

a) Determine the equilibrium levels of Y and i.
b) Describe and show graphically the government's possible policies if it wants to increase output keeping the level of interest rates constant.
c) Would a simultaneous increase of 100 in G and T leave the equilibrium output level unchanged? Motivate your answer.

Solution:

a) The IS relation:

- Goods market equilibrium: Production equal to demand

$$Y = C + I + G$$

$$Y = 120 + 0.3\ (Y - 150) + 0.2Y - 1{,}500i + 200$$

- Solve for Y:

$$Y(1 - 0.3 - 0.2) = 120 - 45 + 200 - 1500i$$

$$Y = (1/0.5) \times (275 - 1{,}500i)$$

$$Y = 550 - 3{,}000i$$

The LM relation:

- Equilibrium in financial markets: Real money supply equal to real money demand

$$\frac{M^s}{P} = \frac{M^d}{P}$$

$$0.6Y - 1200i = 90$$

- Solve for i (convenient when calculating equilibrium)

$$i = \frac{0.6}{1200}Y - \frac{90}{1200}$$

Equilibrium Y and i:

There are several ways of calculating equilibrium Y and i:

- Use LM in IS $\Rightarrow$ Y, then use in IS or LM $\Rightarrow i$
- Use IS in LM $\Rightarrow i$, then use in IS or LM $\Rightarrow$ Y

Do both here:

- First, LM in IS:

$$Y = 550 - 3{,}000i$$

$$Y = 550 - 3000\left(\frac{0.6}{1200}Y - \frac{90}{1200}\right)$$

Solve for Y:

$$2.5Y = 775$$

$$Y = 310$$

Use in IS:

$$Y = 550 - 3{,}000i$$

$$310 = 550 - 3{,}000i$$

$$i = 0{,}08 = 8\%$$

Or in LM:

$$i = \frac{0.6}{1200}Y - \frac{90}{1200}$$

$$i = \frac{0.6}{1200}(310) - \frac{90}{1200}$$

$$i = 0{,}08 = 8\%$$

- Alternatively, first use IS in LM:

$$i = \frac{0.6}{1200}Y - \frac{90}{1200}$$

$$i = \frac{0.6}{1200}(550 - 3000i) - \frac{90}{1200}$$

Solve for i:

$$3000i = 240$$

$$i = 0{,}08 = 8\%$$

Use in IS:

$$Y = 550 - 3{,}000i$$

$$Y = 550 - 240$$

$$Y = 310$$

Or in LM:

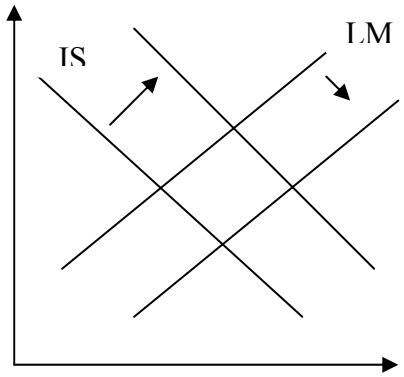
$$0.08 = \frac{0.6}{1200}Y - \frac{90}{1200}$$

$$96 = 0.6Y - 90$$

$$186 = 0.6Y$$

$$Y = 310$$

b) In order to achieve a increase in output without changing interest rates, the government needs to impose a mix of fiscal and monetary policies, shifting both the IS and the LM curve. A fiscal expansion, either due to an increase in government spending or a decrease I taxes, shifts the IS curve to the right and leads to an increase in the equilibrium level of output and the equilibrium interest rate. A monetary expansion shifts the LM curve to the right. The money increase leads to a lower interest rate (in this case to the equilibrium interest rate before the fiscal expansion occurred), which leads to an increase in investment and, in turn, to a further increase in demand and output.



c) Output increases. A change in government expenditure ΔG increases output proportionally, while the changes in taxes ΔT has a smaller effect on output. In detail, an increase in G raises aggregate demand and consequently output increases by ΔG. An increase in taxes leads to lower disposable income, which causes people to decrease their consumption. This decrease in demand leads, in turn, to a decrease in output and income equal to $c_1\Delta T$. Since $\Delta G = \Delta t$ and

$0 < c_1 < 1$, the increase in output due to the increase in spending is higher than the reduction in output due to the increase in taxes.