

Tutorial Note 4: Basic IS-LM Framework

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Derivation of IS-LM Model

Recall that in the goods market, the demand for goods is

$$Z = C + I + G.$$

Recall that consumption depends on disposable income $Y - T$. And in reality, investment depends on output and interest rate:

$$I = I(Y, i),$$

where I increases with Y and decreases with i . (Think about the intuition.)

Then we rewrite the demand as

$$Z = C(Y - T) + I(Y, i) + G.$$

At equilibrium, we have

$$Y = Z.$$

This determines the equilibrium output Y^* . When the nominal interest rate increases, the investment will decrease, shifting the ZZ curve downwards. We have the new equilibrium output Y' , shown as Figure 1.

If we put the interest rate and the output together, then we get the IS relation (Figure 2).

Note that all the pairs (i, Y) is a pair of **equilibrium** values of nominal interest and output.

In the derivation of the IS relation, note that the output is measured in *real term*. Therefore, we should also use real term in the money market equilibrium to derive the **LM relation**. Recall that the nominal money demand is

$$M^d = PYL(i)$$

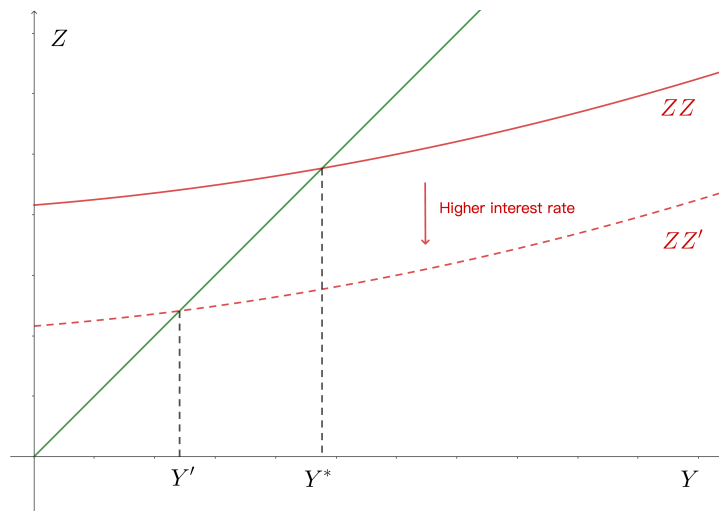


Figure 1: Goods Market Equilibrium

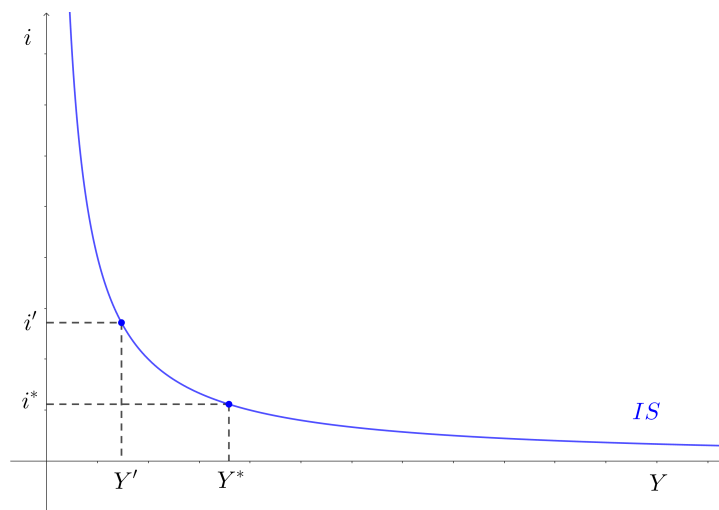


Figure 2: Deriving IS curve from goods market equilibrium

for some decreasing function $L(i)$. The real money demand is

$$\frac{M^d}{P} = YL(i).$$

At equilibrium, $M^d = M^S = M$. In the short run, we assume that prices are sticky. Hence, we have

$$\frac{M}{P} = YL(i).$$

Central banks adjust money supply M to target an interest rate $i = \bar{i}$. Hence, the LM curve is a horizontal line. Putting together with the IS curve, we get Figure 3.

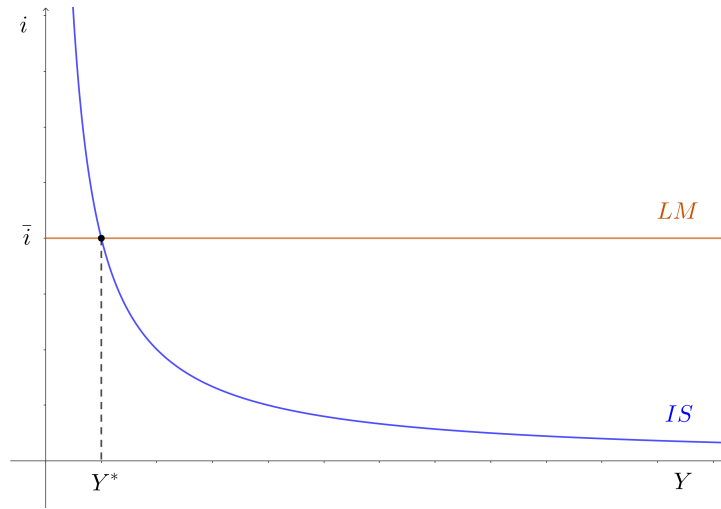


Figure 3: IS-LM Framework

They together yield the **general equilibrium** interest rate and output, (\bar{i}, Y^*) .

Example 1. Suppose that the consumption behavior of people follows:

$$C = 0.8(Y - 300)$$

and the investment follows:

$$I = aY + 510 - 200i,$$

where a is a constant. Suppose that government spending is 300, total export is 200, total import is 400, and the price level is 10.

Suppose that the nominal money demand is

$$M^d = \$Y(0.25 - i),$$

and the government is targeting a nominal interest rate of 5%.

- (1) Let $a = 0.1$. Derive the IS relation and the LM relation. Use the IS-LM framework to derive the equilibrium output.*
- (2) Keep $a = 0.1$. Instead of targeting a nominal interest rate of 5%, the central bank starts to target 4%. How will the equilibrium consumption change?*
- (3) Can we have $a = 0.2$? Explain.*