EE320 - Additional Materials (Topic 3).

Comparative Static Analysis - IS-LM Model.

Assume a closed economy with tax. (see slide 46).

Recall: $Y^* = \dfrac{(a+I_0+G_0)h + iM_0}{ik + h[1-b(1-t)]}$ and $r^* = \dfrac{(a+I_0+G_0)h - [1-b(1-t)]M_0}{ik+h[1-b(1-t)]}$.

A Numerical example.

Given the following information:

① Goods market:

$$Y = C + I$$
$$C = a + bY = 500 + 0.6Y$$
$$I = I_0 - ir = 250 - 100r$$

② Money market:

$$M_s = M_0 = 300$$
$$M_d = kY - hr = 0.2Y - 200r.$$

From the above info, we can derive IS & LM equations.

Goods market: $Y = a + bY - I_0 + ir$

$$\Rightarrow \boxed{Y = \frac{a + I_0 - ir}{(1-b)} \quad : IS.}$$

Money market:

$$M_s = M_d$$
$$M_0 = kY - hr$$

$$\Rightarrow \boxed{Y = \frac{M_0}{k} + \frac{h}{k}r \quad : LM}$$

IS & LM $\Rightarrow$ $Y^* = \dfrac{(a+I_0)h + iM_0}{(1-b)h + ik} = 1{,}800$

$$r^* = \frac{(a+I_0)k - (1-b)M_0}{(1-b)h + ik} = 0.3$$

$\therefore$ Initial equilibrium : $(Y_0^*, r_0^*) = (1800, 0.3)$.

Suppose money supply (M^s) increases to 350. What is the new Y^* and r^*?

From the above, $\underbrace{r_1^* - r_0^*}_{\Delta r^*} = \left[\frac{(a+I_0)k - (1-b)M_1}{(1-b)h + ik}\right] - \left[\frac{(a+I_0)k - (1-b)M_0}{(1-b)h + ik}\right]$

$$\Rightarrow \Delta r^* = \frac{-(1-b)}{(1-b)h + ik} \cdot \Delta M \quad \text{where } \Delta M = M_1 - M_0.$$

or $\boxed{\dfrac{\Delta r^*}{\Delta M} = \dfrac{-(1-b)}{(1-b)h + ik}}$

Similarly, $\boxed{\dfrac{\Delta Y^*}{\Delta M} = \dfrac{i}{(1-b)h + ik}}$

Substitute $b = 0.6$, $i = 100$, $h = 200$, $k = 0.2$

$$\Rightarrow \frac{\Delta r^*}{\Delta M} = -0.004 \quad \text{and} \quad \frac{\Delta Y^*}{\Delta M} = 1.$$

Thus, $\Delta r^* = (-0.004)\Delta M$ and $\Delta Y^* = (1)\Delta M$.
If $\Delta M = 50$, then $\Delta r^* = -0.2$ and $\Delta Y^* = 50$.

$\Rightarrow r_1^* = 0.3 - 0.2 = 0.1$ & $Y_1^* = 1800 + 50$
$Y_1^* = 1850.$