

March 2, 2007

IS-LM model**Keynesian cross model** Supply of goods: $E = Y$ Demand for goods: $E = c_0 + cY - cT + i_0 - br + G$ **Loanable funds model** Investment demand: $I(r) = i_0 - br$ Savings (investment supply): $S(Y, G) = (1 - c)Y - c_0 + cT - G$ Equilibrium in the goods market: $(1 - c)Y + br = c_0 - cT + i_0 + G$

IS curve
$$r = \frac{1}{b} [c_0 - cT + i_0 + G] - \frac{1-c}{b} Y$$

Money market Demand for real money balances: $L^D(r, Y) = l_0 - l_i r + l_Y Y$ Money supply: $L^S = M/P$ Equilibrium in the money market: $\frac{M}{P} = l_0 - l_i r + l_Y Y$

LM curve
$$r = \frac{l_0 - \frac{M}{P}}{l_i} + \frac{l_Y}{l_i} Y$$
 Global short-run equilibrium

IS intersects LM: $\frac{l_0 - \frac{M}{P}}{l_i} + \frac{l_Y}{l_i} Y \stackrel{LM}{=} r \stackrel{IS}{=} \frac{1}{b} [c_0 - cT + i_0 + G] - \frac{1-c}{b} Y$

$$\left(1 - c + \frac{l_Y}{l_i} b\right) Y = c_0 - cT + i_0 + G - l_0 \frac{b}{l_i} + \frac{b}{l_i} \frac{M}{P}$$

AD curve
$$Y = \frac{c_0 - cT + i_0 + G - l_0 \frac{b}{l_i}}{1 - c + \frac{l_Y}{l_i} b} + \frac{M}{(1-c) \frac{l_i}{b} + l_Y} \frac{1}{P}$$
 .

or equivalently:
$$P = \frac{M}{l_0 + \frac{l_i}{b} (cT - G - c_0 - i_0) + (l_Y + \frac{l_i}{b} (1-c)) Y}$$

Evaluating statements

1. "The more sensitive is money demand to changes in income (that is, the larger is l_Y), the flatter will be the LM curve."

Slope of the LM curve is $\frac{l_Y}{l_i}$. It depends positively on l_Y . Hence, the more sensitive is money demand to changes in income, the steeper is the LM curve. FALSE.

2. "The less sensitive is investment to changes in the real interest rate, the flatter is the IS curve."

The slope of the IS curve is $\frac{1-c}{b}$. It depends negatively on b . Hence, the less sensitive is investment to changes in the interest rate, the steeper is the IS curve. FALSE.

3. "The larger the marginal propensity to consume, the flatter is the IS curve."

The slope of the IS curve is $\frac{1-c}{b}$. It depends negatively on c . Hence, the larger the MPC, the flatter will the IS curve be. TRUE.

4. "The more sensitive is money demand to changes in the interest rate, the smaller will be the rightward shift of the LM curve in response to a decrease in real money demand (a fall in l_0)"

To find the size of the rightward shift of the LM curve in response to a change in l_0 we shall use the equation for LM curve: $r = \frac{l_0 - \frac{M}{P}}{l_i} + \frac{l_Y}{l_i} Y$. Here only three variables can change: l_0, r, Y . So, we can write the equation in differences: $\Delta r = \frac{\Delta l_0}{l_i} + \frac{l_Y}{l_i} \Delta Y$. Since we are asked to find the horizontal shift, we keep the interest rate constant: $\Delta r = 0$.

Therefore, the horizontal shift measured in units of output is equal to: $\Delta Y = -\frac{\Delta l_0}{l_Y}$.

It means, that a fall in l_0 really causes an rightward shift. The size of it does not depend on l_i . So the size of the effect does not depend on the sensitivity of money demand to changes in the interest rate. FALSE.

5. "The more sensitive is investment demand to changes in interest rates, the greater will be the (short run) increase in output in the IS-LM model as a result of an increase in government expenditure."

Here we should first find the short-run effect of a change in government spendings on output.

To do this we need to combine the equations for IS and LM, to find how equilibrium Y and r change.

$$\text{IS: } r = \frac{1}{b} [c_0 - cT + i_0 + G] - \frac{1-c}{b} Y \quad \text{LM: } r = \frac{l_0 - \frac{M}{P}}{l_i} + \frac{l_Y}{l_i} Y$$

Here only three variables can change: l_0, r, Y . Take differences:

$$\Delta r = \frac{1}{b} \Delta G - \frac{1-c}{b} \Delta Y \quad \Delta r = \frac{l_Y}{l_i} \Delta Y$$

We are interested in the effect of ΔG on ΔY . So get rid of Δr .

$$\frac{1}{b} \Delta G - \frac{1-c}{b} \Delta Y = \frac{l_Y}{l_i} \Delta Y \quad \Rightarrow \quad \Delta G = (1-c) \Delta Y + b \frac{l_Y}{l_i} \Delta Y$$

Hence, the short-run effect is equal to: $\Delta Y = \frac{\Delta G}{1-c+b \frac{l_Y}{l_i}}$.

If b increases then the effect decreases. Hence, the more sensitive is investment demand to changes in interest rates, the smaller will be the short-run increase in output in response to an increase in government spendings. FALSE.

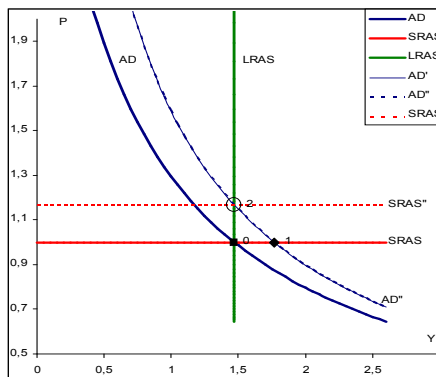
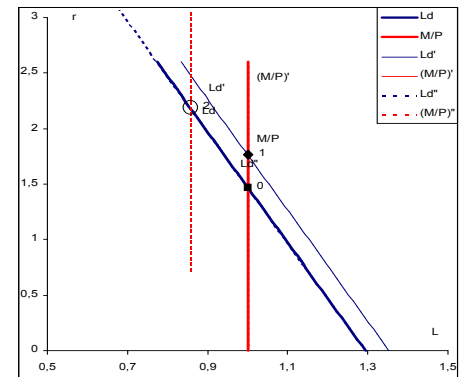
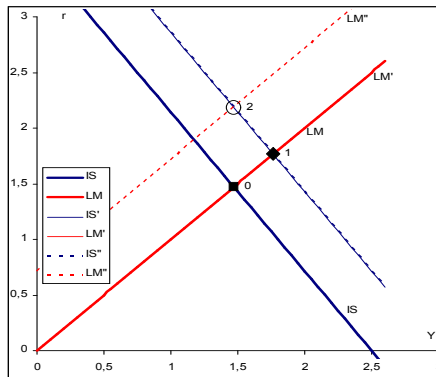
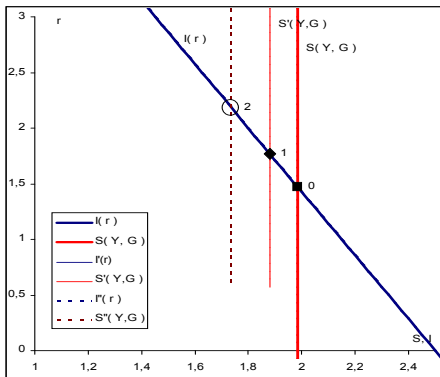
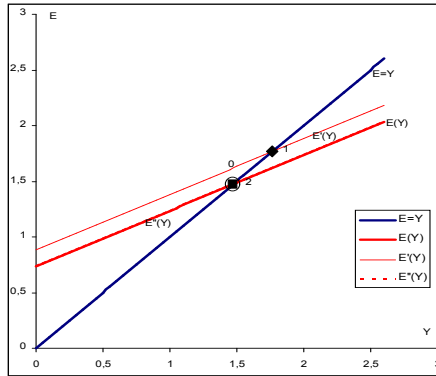
Examples of effects of policy (both SR and LR)

Example 1 : An increase in government expenditure

$G \uparrow \Rightarrow IS$ shifts up $\Rightarrow Y \uparrow, r \uparrow$ in ShortRun.

To come back to the LR level of output need an upward shift in LM.

Hence, $P \uparrow \Rightarrow Y \downarrow$ back to initial level, $r \uparrow$ in the LongRun.



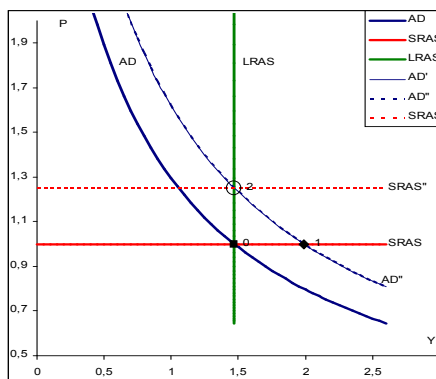
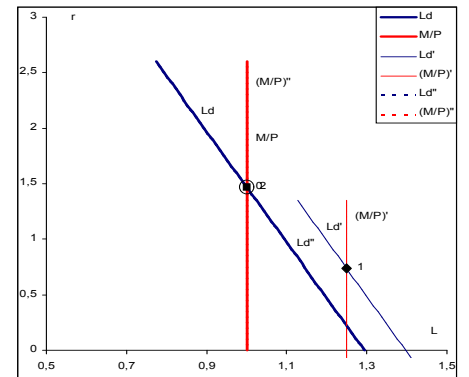
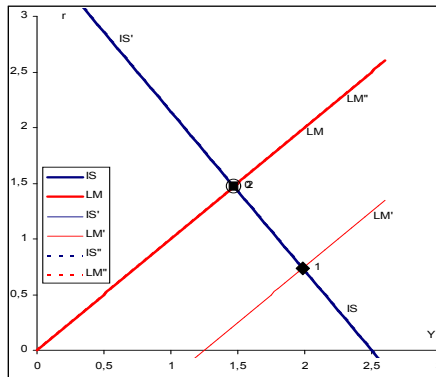
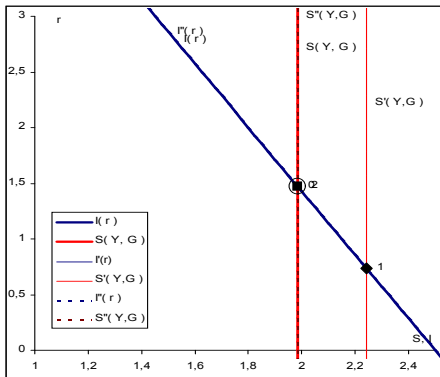
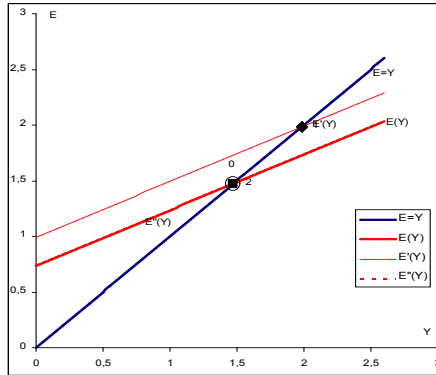
Example 2: An increase in money supply

$M \uparrow \Rightarrow LM$ shifts down $\Rightarrow Y \uparrow, r \downarrow$ in ShortRun.

To come back to the LR level of output need an upward shift in LM.

Hence, $P \uparrow \Rightarrow Y \downarrow$ back to initial level, $r \uparrow$ back to the initial level.

In the LR only prices increase correspondingly to the increase in M.



Example 3: An increase in the sensitivity of investment to interest rates
 $b \uparrow \Rightarrow IS$ shifts down and changes slope as drawn in the picture $\Rightarrow Y \downarrow, r \downarrow$ in ShortRun.
 To come back to the LR level of output need an downward shift in LM.
 Hence, $P \downarrow \Rightarrow Y \uparrow$ back to initial level, $r \downarrow$ even more.
 In the LR only prices decrease correspondingly as well as the interest rates.

