Members Gr. 1

6304640052

6304640136

6304640144

6304641035

$\boxed{1}$ endogenous variables : P, Q

Demand: Q = 10000 + 400 × (T − 30) − 10P

Supply: Q = 2000 + 20P

1.1) LHS vs. RHS

$$Q + 10P = 10000 + 400(T-30) \quad ; T = 40$$
$$Q - 20P = 2000$$

1.2) $Ax = d$

$$\begin{bmatrix} 1 & 10 \\ 1 & -20 \end{bmatrix}\begin{bmatrix} Q \\ P \end{bmatrix} = \begin{bmatrix} 10000 + 400(T-30) \\ 2000 \end{bmatrix} = \begin{bmatrix} 14000 \\ 2000 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 10 \\ 1 & -20 \end{bmatrix}$$

$$|A| = -30$$

$$cof(A) = \begin{bmatrix} -20 & -1 \\ -10 & 1 \end{bmatrix}$$

$$adj(A) = \begin{bmatrix} -20 & -10 \\ -1 & 1 \end{bmatrix}$$

$$A^{-1} = \frac{1}{-30}\begin{bmatrix} -20 & -10 \\ -1 & 1 \end{bmatrix}$$

$$Ax = d$$
$$x = A^{-1}d$$
$$= \frac{1}{-30}\begin{bmatrix} -20 & -10 \\ -1 & 1 \end{bmatrix}\begin{bmatrix} 14000 \\ 2000 \end{bmatrix}$$
$$= \frac{-1}{30}\begin{bmatrix} -300000 \\ -12000 \end{bmatrix}$$
$$x = \begin{bmatrix} 10000 \\ 400 \end{bmatrix}$$

$Q^* = 10,000$ units #

$P^* = 400$ \$ per unit #

$\boxed{2}$ $C = C_0 + C_1 Y_d - C_2 r,\quad 0 < C_1 < 1$ $\qquad Y_d = Y - T$

$I = I_0 + I_1 Y - I_2 r,\quad 0 < I_1 < 1$

$G = G_0 - G_1 Y,\quad 0 < G_1 < 1$

$T = T_0$

$M^s = M_0$

$L^d = L_0 + L_1 Y - L_2 r$

a) It makes sense since when income increases, government has to decrease government spending in order to prevent too much money injection to the circular flow (prevent inflation)
To prevent output from being too high in an expansion.

b) $C_2$ represents MPS = marginal propensity to save, when the MPS is higher, they will consume less but save more.
Thus, the assumption makes sense.

c) derive IS equation

$$Y = C + I + G$$
$$Y = C_0 + C_1(Y - T_0) - C_2 r + I_0 + I_1 Y - I_2 r + G_0 - G_1 Y$$
$$Y = C_0 + C_1 Y - C_1 T_0 - C_2 r + I_0 + I_1 Y - I_2 r + G_0 - G_1 Y$$
$$Y - C_1 Y - I_1 Y + G_1 Y = C_0 - C_1 T_0 - C_2 r + I_0 - I_2 r + G_0$$
$$Y^* = \frac{C_0 - C_1 T_0 - C_2 r + I_0 - I_2 r + G_0}{1 - C_1 - I_1 + G_1}$$

There is a negative relation between real GDP and interest rate
when interest rate increase by 1 unit
real GDP will decrease by $\frac{C_2 + I_2}{1 - C_1 - I_1 + G_1}$ units

d) Slope IS curve $= \frac{\Delta r}{\Delta Y^*} = \frac{1-C_1-I_1+G_1}{-C_2-I_2} = \frac{-1+C_1+I_1-G_1}{C_2+I_2}$

- It will be flat when $C_2+I_2$ is large, thus, real GDP is high sensitive to change of interest rate
- or when $-1+C_1+I_1-G_1$ is small, the IS curve will be flat

e) Slope IS curve $= \frac{\Delta r}{\Delta Y^*} = \frac{1-C_1-I_1+G_1}{-C_2-I_2} = \frac{-1+C_1+I_1-G_1}{C_2+I_2}$ small

$$\frac{\Delta Y^*}{\Delta T_0} = \frac{-C_1}{\underbrace{1-C_1-I_1+G_1}_{\text{small}}}$$ ⇐ tax multiplier

small denominator ⇒ large multiplier

when MPC is high the IS curve will be flat, in this question MPC which is $C_1$, if $C_1$ is high the tax multiplier will be larger. The flat IS curve, which should has small numerator $|-1+C_1+I_1-G_1|$ making the tax multiplier big.

f)

$$L^s = L^d$$

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

$$\frac{M_0}{P} = L_0 + L_1Y - L_2r$$

$$r^* = \frac{L_0P + L_1PY - M_0}{L_2P} = \frac{L_0}{L_2} + \frac{L_1}{L_2}Y - \frac{M_0}{L_2P}$$

There is a positive relation between interest rate and real GDP when output increases by 1 unit, interest rate also increase by $\frac{L_1}{L_2}$

g) slope of LM curve $= \frac{\Delta r}{\Delta Y^*} = \frac{L_1}{L_2}$

LM curve flat when $L_1$ is low and $L_2$ is high thus interest rate has low sensitivity to change in real GDP

h) endo: C, Yd, r, I, G, Y

- $Y = C_0 + C_1 Y - C_1 T_0 - C_2 r + I_0 + I_1 Y - I_2 r + G_0 - G_1 Y$

$Y - C_1 Y + C_2 r - I_1 Y + I_2 r + G_1 Y = C_0 - C_1 T_0 + I_0 + G_0$ ⇐ LHS vs. RHS

$(1 - C_1 - I_1 + G_1) Y + (C_2 + I_2) r = C_0 - C_1 T_0 + I_0 + G_0$

- $r = \dfrac{L_0 P + L_1 P Y - M_0}{L_2 P}$

$-L_1 P Y + L_2 P r = L_0 P - M_0$ ⇐ LHS vs. RHS

$$\underbrace{\begin{bmatrix} 1 - C_1 - I_1 + G_1 & C_2 + I_2 \\ -L_1 P & L_2 P \end{bmatrix}}_{A} \cdot \underbrace{\begin{bmatrix} Y \\ r \end{bmatrix}}_{x} = \underbrace{\begin{bmatrix} C_0 - C_1 T_0 + I_0 + G_0 \\ L_0 P - M_0 \end{bmatrix}}_{d}$$

i) $$Y^* = \frac{|A_1|}{|A|} = \frac{\begin{vmatrix} C_0 - C_1 T_0 + I_0 + G_0 & C_2 + I_2 \\ L_0 P - M_0 & L_2 P \end{vmatrix}}{\begin{vmatrix} 1 - C_1 - I_1 + G_1 & C_2 + I_2 \\ -L_1 P & L_2 P \end{vmatrix}} = \frac{(C_0 - C_1 T_0 + I_0 + G_0) L_2 P - (C_2 + I_2) L_0 P + (C_2 + I_2) M_0}{(1 - C_1 - I_1 + G_1) L_2 P + (C_2 + I_2) L_1 P}$$

$$r^* = \frac{|A_2|}{|A|} = \frac{\begin{vmatrix} 1 - C_1 - I_1 + G_1 & C_0 - C_1 T_0 + I_0 + G_0 \\ -L_1 P & L_0 P - M_0 \end{vmatrix}}{\begin{vmatrix} 1 - C_1 - I_1 + G_1 & C_2 + I_2 \\ -L_1 P & L_2 P \end{vmatrix}} = \frac{(1 - C_1 - I_1 + G_1) L_0 P - (1 - C_1 - I_1 + G_1) M_0 + (C_0 - C_1 T_0 + I_0 + G_0) L_1 P}{(1 - C_1 - I_1 + G_1) L_2 P + (C_2 + I_2) L_1 P}$$

j) $\frac{\Delta y^*}{\Delta G_0}$ $\frac{\Delta y^*}{\Delta M_0}$ $\frac{\Delta r^*}{\Delta G_0}$ $\frac{\Delta r^*}{\Delta M_0}$

$$y^* = \frac{(C_0 - C_1T_0 + I_0 + G_0)L_2P - (C_2+I_2)L_0P + (C_2+I_2)M_0}{(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P}$$

$$r^* = \frac{(1-C_1-I_1+G_1)L_0P - (1-C_1-I_1+G_1)M_0 + (C_0-C_1T_0+I_0+G_0)L_1P}{(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P}$$

$$\frac{\Delta y^*}{\Delta G_0} = \frac{L_2P}{(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P} = \frac{L_2}{(1-C_1-I_1+G_1)L_2 + (C_2+I_2)L_1}$$

$$\frac{\Delta y^*}{\Delta M_0} = \frac{C_2+I_2}{(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P}$$

$$\frac{\Delta r^*}{\Delta G_0} = \frac{L_1P}{(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P} = \frac{L_1}{(1-C_1-I_1+G_1)L_2 + (C_2+I_2)L_1}$$

$$\frac{\Delta r^*}{\Delta M_0} = \frac{-1+C_1+I_1-G_1}{(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P}$$

when $G_1 = 0$, the denominator will be less
so, the multiplier will be bigger both on $\frac{\Delta y^*}{\Delta G_0}$ and $\frac{\Delta r^*}{\Delta G_0}$

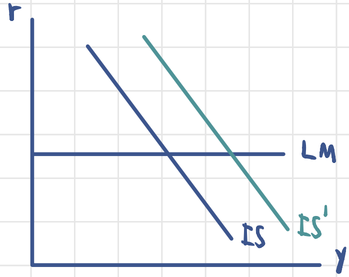
k) $$\frac{\Delta Y^*}{\Delta G_0} = \frac{L_2 P}{(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P}$$

$$\frac{\Delta Y^*}{\Delta M_0} = \frac{C_2+I_2}{(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P}$$

Real GDP increased by 100 $\Rightarrow$ $\Delta Y^* = 100$

Fiscal policy : $\Delta G_0 = \frac{100}{L_2P}\left[(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P\right]$

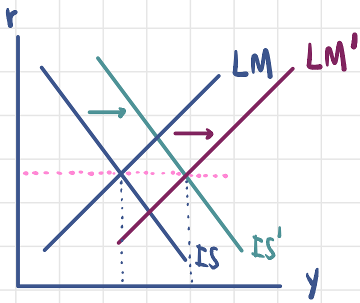
Monetary policy : $\Delta M_0 = \frac{100}{C_2+I_2}\left[(1-C_1-I_1+G_1)L_2P + (C_2+I_2)L_1P\right]$

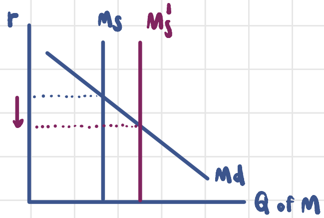



It would work due to change in government expenditure under the condition that slope of LM = 0 which mean $L_1 = 0$

l) slope of IS curve $= \frac{-1+C_1+I_1-G_1}{C_2+I_2}$ ; slope of LM curve $= \frac{L_1}{L_2}$

If condition from k) slope of LM = 0 does not hold, they have to use both fiscal and monetary policies




Government uses fiscal policy by increasing government spending leads to increase in real GDP which makes the IS curve shift to the right however, interest rate increase

Central bank uses monetary policy by increasing money supply which leads to decrease in interest rate.

The decline in interest rate encourage the private consumption cause the output higher, thus, the LM curve shift to the right

To conclude, the real GDP increases while interest rate stays the same.