Example 3.M Consider the following model equations that explain the behavior of goods and money market.

$C = 0.8(Y - T)$ $\rightarrow C^* = 0.8(4000 - 1000)$

$= 2{,}400$

$T = 1{,}000$

$I = 800 - 20r$

$I^* = 800 - 20(10) = 600$

$G = 1{,}000$

$Y = C + I + G$

$S = Y_d - C$

$M^d = 0.4Y - 40r$

Eq^2 in good market

$M^S = 1{,}200$

$= 3000 - 2{,}400$ (y; r)

$= 600$

Write numerical formula for IS equation

new

1,200

$y = C + I + G$

$y = 0.8(y - 1000) + 800 - 20r + 1{,}000$

$y = 0.8y - 800 + 800 - 20r + \cancel{1{,}000}$ 1,200

$0.2y = \cancel{1{,}000} - 20.r$ 1,200

$y = 5(1{,}000 - 20.r)$ — $\boxed{\text{Is Equation}}$

$y = 5(1{,}200 - 20.r)$: new Is equation

Write numerical formula for LM equation

$M^d = M^s$

$0.4y - 40 \cdot r = \cancel{1{,}200}$ 1,400

$40r = 0.4y - 1{,}200$

$r = \frac{1}{40}(0.4y - 1200)$

$\rightarrow r = 0.01y - 30 \rightarrow$ LM Equation

Solve for endogenous equilibrium solution of "Y", "C", "I" and "saving".

Equ: $(y^*, r^*) \rightarrow$ Solve IS/LM Equations

$y = 5(1000 - 20 \cdot r) = 5000 - 100r$

$r = 0.01y - 30$

$y = 5000 - 100(0.01y - 30)$

$= 5000 - (y) + 3{,}000$

$y^* = \frac{8000}{2} = 4{,}000 \; ; \; r^* = 40 - 30 = 10$

general Equ^n for IS-LM Model

What happen to equilibrium "Y" when G increases by 200.

old new

$G = 1{,}000 \rightarrow G = 1000 + 200 = 1{,}200$

$y = 5(1200 - 20 \cdot r)$: new IS

$r = 0.01 \cdot y - 30$: original LM

$y = 5[1200 - 20(0.01y - 30)]$

$= 6{,}000 - 100(0.01y - 30) = 6{,}000 - y + 3{,}000$

$2y = 9000$

$y^* = 4{,}500$ new y^*

Back to when G is equal to 1000. What happen to equilibrium "Y" when money supply increases by 200.

$M^d = M^s$

$0.4y - 40r = 1{,}400$

$r = \frac{0.4y - 1{,}400}{40} \rightarrow$ new LM $\Big\}$ $r = \frac{0.4y - 1400}{40}$

$y = 5(1000 - 20r)$

$= 5(1000 - \frac{20}{40}(0.4y - 1{,}400))$

$y = 5000 - \cancel{0.2y} + \cancel{700}$ ($1y$, $3{,}500$)

$1.2y = 5700 \rightarrow \cancel{y = 4{,}750}$ number wrong

$2y = 8{,}500$

$\boxed{y^* = 4{,}250}$

Measuring in term of the change in output, which policy is more effective? Explain the reason.

Policy Effective: how much output can you change /control ?

for a unit change in the policy variable

	old	new	
G	1,000	1,200 M fixed	⇒ 4,500
	4,000		
M	1,200	fixed 1,000	
		M. 1,400	⇒ 4,250

$\Delta Y / \Delta G = \frac{500}{200}$ (Multiplier of G is 2.5)

$\rightarrow \frac{\Delta Y}{\Delta M} = \frac{250}{200} = 1.25$ multipler of money supply.

Multiplier G > Multipler M^S

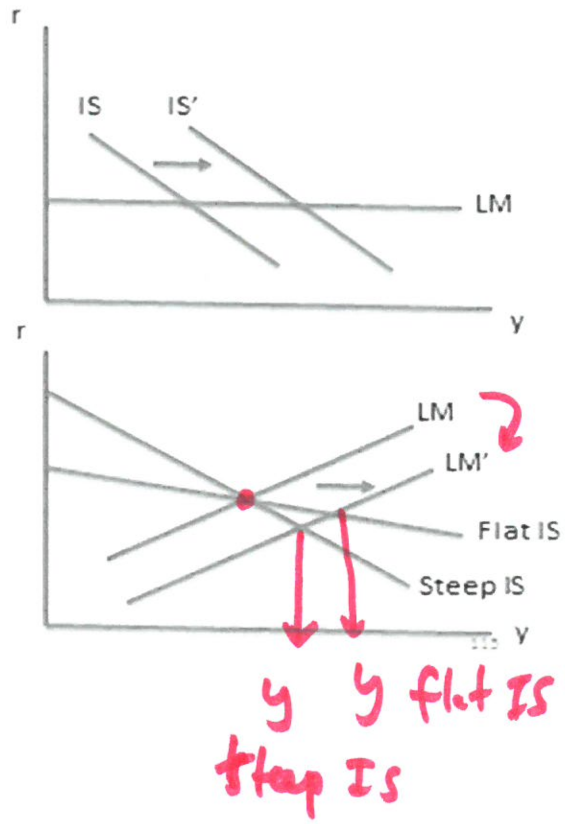
→ Government Purchase is more Effective.

The issue on Policy effectiveness!

- Compare the multipliers that arise under two different types of policy
- In general, government purchase is more effective than tax policy.
  - Is there a case against this conclusion? Think about it!
- What we have seen from EC212 are the following conclusions!
  - The flatter is the IS curve; the more effective is monetary policy in influencing output.
  - The flatter is the LM curve; the more effective is fiscal policy in influencing output.

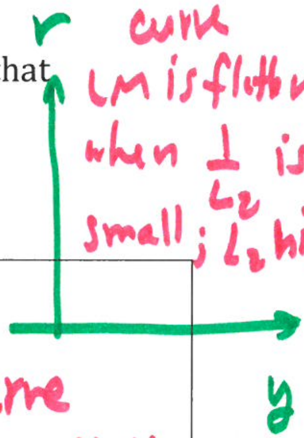
Relative slope of IS and LM curve

- Which policy is more effective depends on the relative slope of IS and LM curve.
  - LM relatively flatter → Fiscal policy
  - IS relatively flatter → Monetary policy
- Next, we will show this.



Example 3.N: Using the IS-LM equation derived above, and show that

$$\frac{multiplier\ of\ M}{multiplier\ of\ G} = \frac{I_1}{L_2}$$



curve LM is flatter when $\frac{1}{L_2}$ is small; L_2 high

IS equation:

$$Y = \frac{1}{1-b(1-t)}[a - bT_0 + I_0 - I_1 r + G_0]$$

curve IS is flatter when; $\frac{I_1}{1-b(1-t)}$ high

→ I_1 is high

LM equation:

$$r = \frac{1}{L_2}\left(L_0 + L_1 Y - M_0^s\right)$$

$\boxed{\text{LM is flat when } L_2 \uparrow \quad \text{IS is flat when } I_1 \uparrow}$

Solve:

$$y = \overbrace{\frac{1}{1-b(1-t)}}^{=K}\left[\underbrace{a - bT_0 + I_0 \quad + G_0}_{\text{Autonomous Expenditure}} - \frac{I_1}{L_2}(L_0 + L_1 y - M_0^s)\right]$$

$$y = k \cdot [a - bT_0 + I_0 + G_0] - k \cdot \frac{I_1}{L_2}\left(L_0 + L_1 y - M_0^S\right)$$

$$y = k\left[\ \bar{A}\ \right] - k\cdot\frac{I_1}{L_2}\cdot L_1\cdot y - k\cdot\frac{I_1}{L_2}\left(L_0 - M_0^S\right).$$

$$y + k\cdot\frac{I_1}{L_2}\cdot L_1\cdot y = k\cdot\bar{A} - k\cdot\frac{I_1}{L_2}\left(L_0 - M_0^S\right).$$

$$\underbrace{y\left(1 + k\cdot\frac{I_1}{L_2}\cdot L_1\right)}_{J > 0} = k\bar{A} - k\cdot\frac{I_1}{L_2}\left(L_0 - M_0^S\right)$$

$$k = \frac{1}{1 - b(1-t)}$$

(multiplier of AE when r is fixed!)

$$y^* = \frac{1}{J}\left(k\cdot\bar{A} - k\cdot\frac{I_1}{L_2}\left(L_0 - M_0^S\right)\right)$$

$$y^* = \frac{1}{J}\left(k\cdot\left(a - bT_0 + I_0 + G_0\right) - k\cdot\frac{I_1}{L_2}\left(L_0 - M_0^S\right)\right)$$

$\frac{1}{J} \to > 0$

$$\frac{\Delta y^*}{\Delta G_0} = \frac{K}{J} = \underbrace{\frac{K}{1 + K \cdot \frac{I_1}{L_2} \cdot L_1}}_{G.E.} \; ; \; < \underbrace{K}_{\text{multiplier of } G \text{ when "r" is fixed}}$$

$\square - \square$ Crowding out Effect of G_0

$$\frac{\Delta y^*}{\Delta M_0^S} = -\frac{K}{J}\left(\frac{I_1}{L_2}\right)(-1)$$

$$= \frac{K}{J}\left(\frac{I_1}{L_2}\right)$$

$$\frac{\Delta y^* / \Delta MS_0}{\Delta y^* / \Delta G_0} = \frac{\frac{K}{J} \cdot \frac{I_1}{L_2}}{\frac{K}{J}} = \frac{I_1}{L_2}$$

$$\frac{\text{Multiplier } M^S}{\text{Multiplier } G} = \cancel{\frac{I_1}{L_2}} = \frac{I_1}{L_2}$$

I_1 hish $\rightarrow$ IS is flat $\rightarrow$ MP

L_2 hish $\rightarrow$ LM is flat $\rightarrow$ FP

M^S is better than G ; $\frac{I_1}{L_2}$ ~~is~~ $> 1 \Rightarrow I_1 > L_2 \Rightarrow \underline{\underline{MP}}$.

M^S is worse than G ; $\frac{I_1}{L_2} < 1 \Rightarrow I_1 < L_2 \Rightarrow$ FP

Coeffcient associcted to "r" in the LM Equation.

L_2: "M^d; r" $M^d = L_0 + L_1 y - L_2 r$