"The Position of the LM Curve"

While deriving the LM curve, the real money supply (M/p) is held constant. So a change in the real money supply will shift the LM curve.

Let us see what is the effect of an increase in the real money supply.

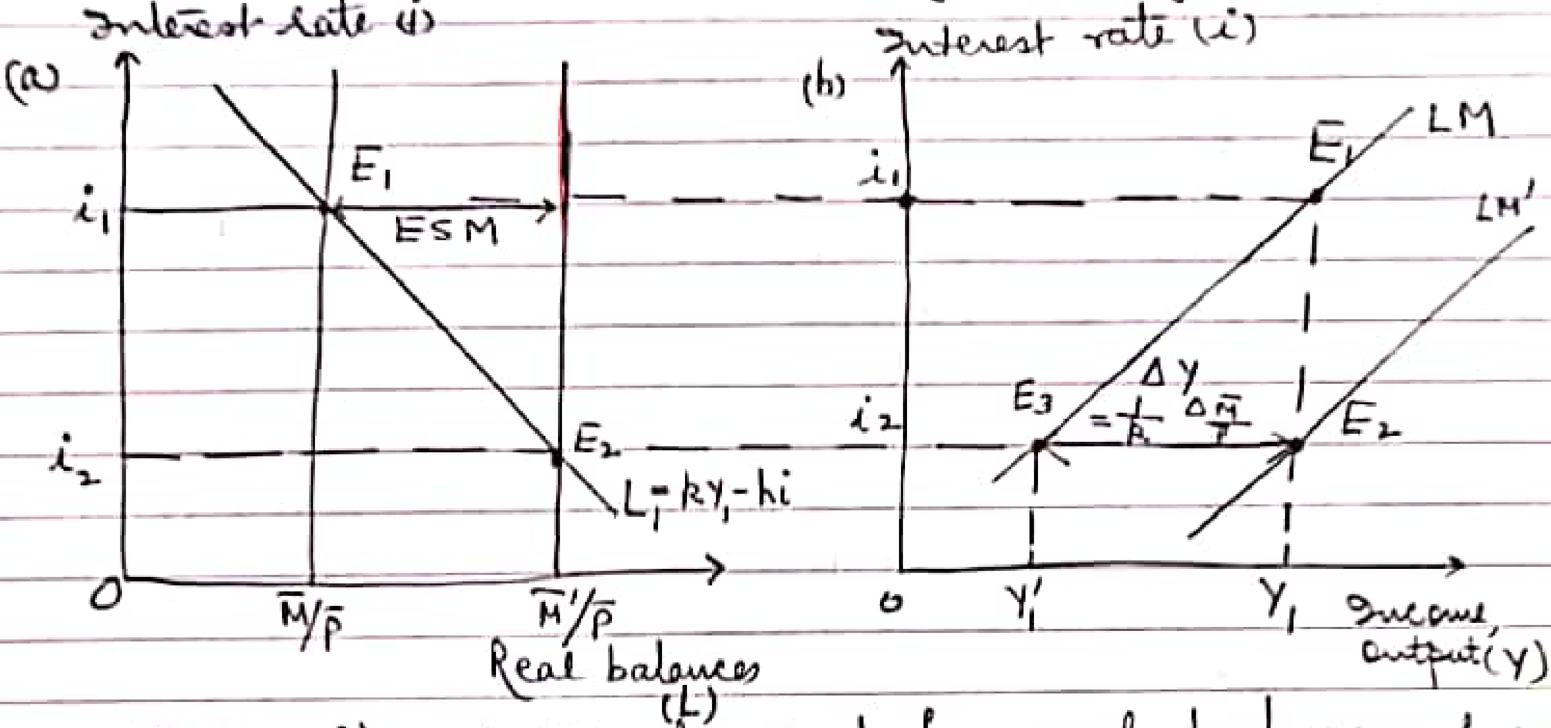


Fig (a) shows the demand for real balances for a level of income Y_1. With the initial real money supply, $\bar{M}/\bar{P}$ the equilibrium in the money market is obtained at E_1, the rate of interest is i_1. The combination of income Y_1 and interest rate i_1, gives us a point E_1 on LM_1 curve.

Suppose the real money supply increases to $\bar{M}'/\bar{P}$. The money supply curve shifts to the right to $\bar{M}'/\bar{P}$. At the initial rate of interest i_1, there is excess supply of money (ESM) in the market (as $S_m > D_m$). To restore money market equilibrium at the income level Y_1, the demand for real money balances has to increase & for that the interest rate has to decline to i_2. The new equilibrium is therefore at E_2. This implies that the LM curve shifts to the right & down to LM'. At each level of income, the equilibrium interest ~~ra~~ rate has to be lower to induce people to hold the larger real quantity of money. (eg at Y_1, the interest rate declines from i_1 to i_2 to increase the demand for money & bring back the equilibrium.).

Alternatively, at each level of the interest rate, the level of income has to be higher to raise the transactions demand for money & thereby absorb the higher real money supply. (eg at i_2, the level of income has to increase to Y_1 from Y_1'). Above points can be confirmed by looking at the money market equilibrium condition.

$$\bar{M}/\bar{P} = kY - hi.$$

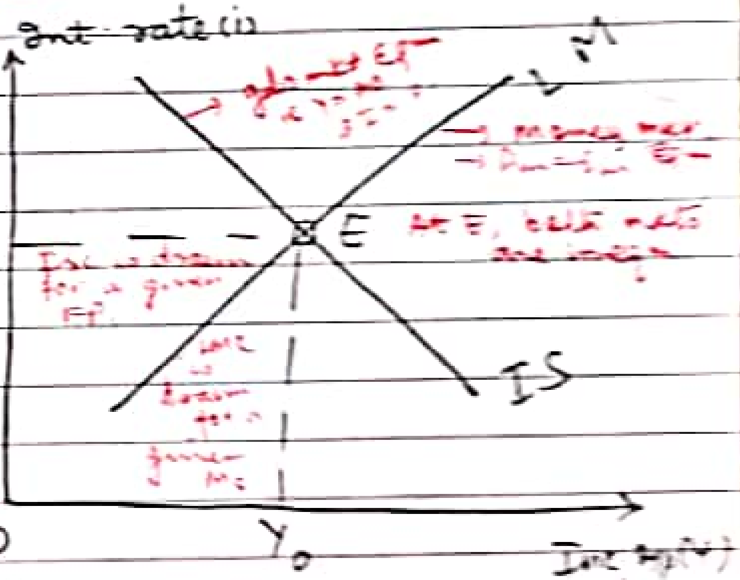
The rightward shift in the LM curve is to the extent of $\left(\frac{\Delta \bar{M}}{\bar{P}} \cdot \frac{1}{k}\right)$ ie change in real money supply multiplied by $1/k$. $\left(k = \frac{\Delta L}{\Delta Y}\right)$. Refer to fig(b).

$(AD = (\bar{C} + c(\overline{TR}) + \bar{I} + \bar{G}) + c(1-t)Y - bi)$

③

From the desk of " **Simultaneous Eqm in the Goods & money mkts"** (21)

The IS curve shows combns of int. rate & income that satisfy eqm in the gds mkt. The LM curve shows combns of int. rate & income that satisfy eqm in the money mkt. The intersection of the IS curve & LM curve shows the int. rate & income that satisfy eqm in both mkts simultaneously. This is satisfied at pt E.



The eqm sol is:- i_0 & the eqm level of inc is Y_0, given the exogenous vars in partr, the real money ss & fiscal policy. (In gen, exog. vars are those whose values are not detd within the model system being studied)

At pt E, both the gds mkt & the money mkt are in eqm.

Fig 10 shows the int rate & the level of o/p are detd by the interaction of the money (LM) and gds (IS) mkts.

At this level of int. rate & inc, agg dd is = o/p; Inv is = Savings* & dd for real balances is equal to ss of money.

* Shown in prev chp when Y = AD, S = I.

In Beginning → Assume ① P is Constant
② SR agg SC is flat.

④

(ie AD = Y, I = S, dd for money = ss of money)

So, at pt E, int. rates & inc. levels are such that the public holds the existing money stock (ie $D_M = S_M$) & planned spending equals O/P.

It's worth looking at the meaning of the eq^m at E. The major assm is that the pc level is constant & that firms are willing to ss whatever amt of O/P is dd at that pc level. Thus, we assume that the level of O/P, Y_0 (in fig) will be willingly supplied by firms at the pc level $\bar{P}$. This assm corresponds to the assm of a flat, Sh-run agg supply curve.

At pt E, the econ is in eq^m, given the pc level ∵ both the gds & money mkts are in eq^m. The dd for gds = level of o/p on the IS curve (ie Y = AD). And, on the LM curve, the dd for money = ss of money.

Shift in the IS curve: $\Delta Y = \alpha_G \Delta \bar{A}$

not needed now (Shift in the LMC → $\Delta Y = \frac{1}{k} \Delta M$) 26

⑤

From the desk of "Changes in the eq^m levels of income & the int. rate" DATE 22

The eq^m levels of income & the int. rate change when either the IS or the LM curve shift.

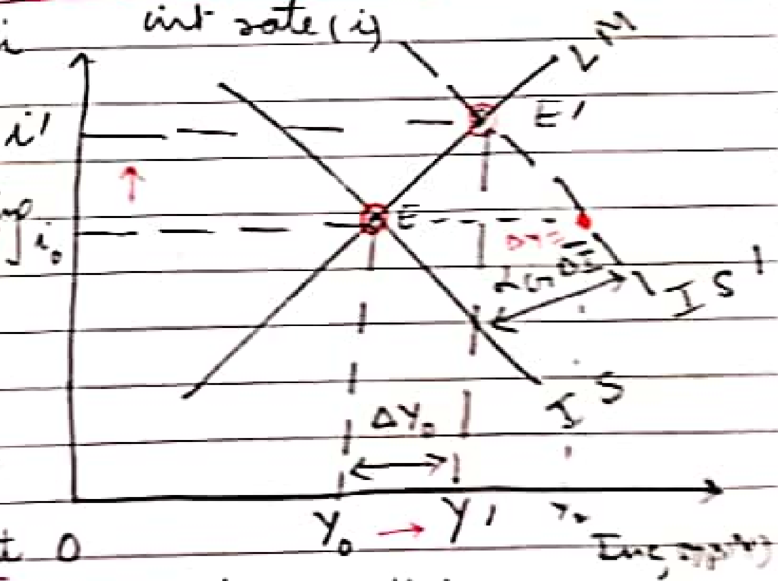
$\bar{I}$↑ Fig shows the effects of an ↑ in the rate of auton. Inv. on the eq^m levels of inc. & the int. rate. Such an ↑ in auton. Invt raises auton spending, $\bar{A}$ & so shifts the IS curve ~~to the~~ right. That results in a rise in the level of income & an ↑ in the int. rate at pt E'. So the eq^m roi & level of inc. both rise as a result of an ↑ in auton. spending (wh. shifts the IS curve to the right).

$\bar{A}$↑

IS - rt

[inc ↑ roi ↑]

Both roi & inc ↑



Recall that An ↑ in the auton. Inv spending $\Delta \bar{I}$, shifts the IS curve to the rt by the amt $\alpha_G \Delta \bar{I}$, as shown. As a result of this the ↑ in income is only ΔY_0 ie from Y_0 to Y_0'. This ↑ in income is less than the magnitude of shift in the IS curve (ie $\alpha_G \Delta \bar{I}$).

$\alpha_G \Delta \bar{I}$

only ΔY_0

$\Delta Y <$ shift in IS →

Reason: Increase in auton Inv. (AD ↑) res the level of income. But an ↑ in income res dd for real money balances. Given the fixed money supply, the roi must ↑ to

$\bar{I}$ ↑ Y ↑ Dm ↑

(sell bonds, S_B ↑, P_B ↓, roi ↑ ,

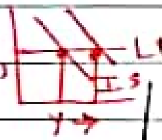
$\Delta Y < \alpha_G \Delta \bar{I}$

i ↑ ensure that the dd for money stays equal to the ss of money. when the r.o.i rises there is

↓ Inv a fall in Invt spending. This is ∵ Invt spending is negatively related to the r.o.i. With Invt falling, the eqm ↑ in inc. is only Y_0Y', wh. is less than the horiz'l shift of the IS curve, $\alpha_G \Delta \bar{I}$ (Y_0Y_2).

Diagrally, { If the LM curve were horiz'l there wld be no diff^ce bet. the extent of the horiz'l shift of the IS curve & the Δ in income. If the LM C were horiz'l the r.o.i wld not change when the IS curve shifts. }) (i↑0 no fall in Inv dy)

Diag'lly, explain lies in the slope of the LM curve



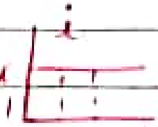
In the above case, a "CROWDING OUT" effect has occured. Increased autom. Invt spending causes a hr. int. rate, wh. results in a lower level of induced Invt. Thus, the autonomous increase in Invt spending "CROWDS OUT" the interest sensitive invt spending.

?

L = kY − hi

(It will be done later).

happens when h → ∞ ⇒ slope → 0

LM horizontal ⇒ 

$\text{Slope} = \frac{\boxed{k}}{h} = 0 \Rightarrow k = 0$

$\Rightarrow \frac{\Delta L}{\Delta Y} = 0$: dd for real bals is not at all affected by Δ in income ∴ r.o.i will not rise (~~as a result of~~ ~~in dd for money balances~~).

~~So ΔY will not lead to any Δ in dd for real bal~~

The IS-LM model is very helpful for studying the effects of Mon. & Fiscal policy on the inc. & the r.o.i. Done in chp 11.

AS

Numericals (IS-LM Model)

32
①

(Q1) The Inv. eqⁿ is given by $I = \bar{I} - bi$
$I = 100 - 5i$

Plot the Inv. curve. Name it I_1. Sup. there is an ↑ in auto. Inv. by 20, plot the new Inv. curve & name it I_2. (Assume 3 rates of int. 6%, 8% and 10%)

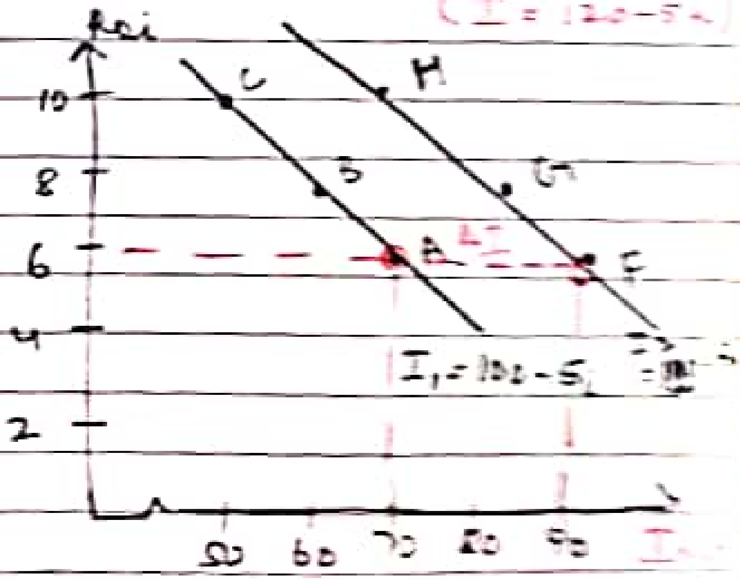
Ans We assume 3 roi 6%, 8% and 10% & the corresg levels of Inv are detd respectively. Points A, B and C are plotd. Joining A, B & C we obtain the $I_1 = 100 - 5i$ curve

$I = 100 - 5i$ → $\bar{I}$ [illegible]

Points	Roi	I_1	Points	I_2
A	6%	100-30=70	F	120-30 = 90
B	8%	100-40 = 60	G	120-40 = 80
C	10%	100-50 = 50	H	120-50 = 70

$(I = 120 - 5i)$

Auto Inv rises by 20
∴ new Inv. curve is $I_2 = 120 - 5i$
An ↑ in $\bar{I}$ shifts the Inv. curve parallel rtward.



$I_1 = 100 - 5i$
$I_2 = 120 - 5i$
$\Delta I = 120 - 100 = 20$

Q2) Savs. fn: $S = -40 + 0.2Y$.
Inv. fn: $I = 100 - 5i$. Derive eqn for the IS curve & plot the same (taking i = 6%, 8% & 10%)

Soln. $S = I$ on IS curve (since Y = AD)

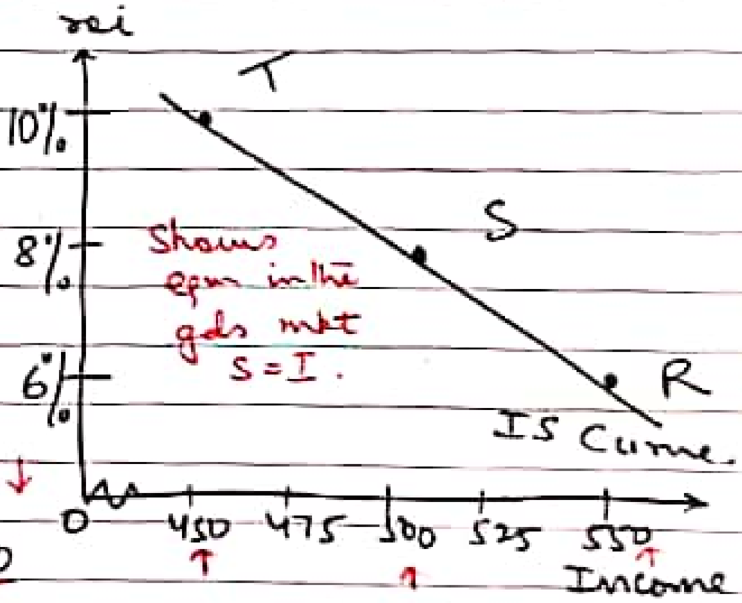
$\Rightarrow -40 + 0.2Y = 100 - 5i$

$0.2Y = 140 - 5i \Rightarrow Y = \frac{140}{0.2} - \frac{5}{.2}i$

$\rightarrow \boxed{Y = 700 - 25i}$

we ass. 6%, 8% and 10% roi & obtain the corresg eqm levels of inc. in the gds mkt.

Points	roi	$Y = 700-25i$
R	6%	$Y = 700-25(6) = 550$
S	8% ↑	$Y = 700-25(8) = 500$ ↓
T	10%	$Y = 700-25(10) = 450$



Calc (10 m) Q3) Given $C = 10 + 0.75Y \Rightarrow mpc = 0.75$

$I_1 = 150 - 10i \Rightarrow b = 10 \rightarrow \frac{\Delta I}{\Delta i} = b$

. Derive the IS curve eqn & name it IS_1 when plotted on a graph. Sup the cn fn remains unchanged & the Inv. fn Des (coeff b Des) to $I_2 = 150 - 5i$ (= b=5) Derive new IS curve eqn & name it IS_2 when plotted

Eqn of IS Curve: $Y = \alpha_G(\bar{A} - bi)$ Y as a fn of the rei

$i = \frac{\bar{A}}{b} - \frac{1}{b\alpha_G}Y$: slope $= \frac{\Delta i}{\Delta Y} = \frac{1}{b\alpha_G}$

From the desk of ⑨ DATE ②

Comment on the shapes of IS_1 & IS_2.

Result (b has fallen ⇒ $\frac{1}{\alpha_G b}$ will ↑ ⇒ ISC -- steeper

Ans: 1st obtain IS_1 Curve Eqn. AD = C + I

In eqm, Y = C + I ie Y = AD

$$Y = \underbrace{10 + 0.75Y}_{C} + \underbrace{150 - 10i}_{I}$$

$0.25Y = 160 - 10i \Rightarrow Y = \frac{160}{.25} - \frac{10}{.25}i$

$IS_1 \Rightarrow \boxed{Y = 640 - 40i}$

slope = 40

when rei = 10%,

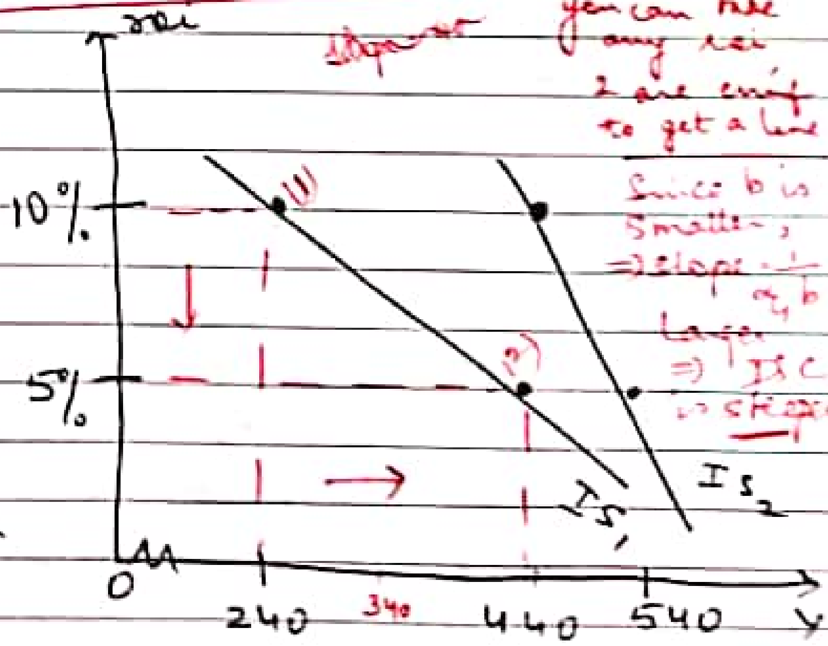
$Y = 640 - 40(10)$

i↓ $= \underline{240}$

when rei = 5%,

Y↑ $Y = 640 - 40(5)$

$= \underline{440}$



you can take any rei 2 are enough to get a line

Since b is smaller, ⇒ slope $\frac{1}{\alpha_G b}$ larger ⇒ ISC is steeper

Inc.

Now obtain IS_2 eqn

$Y = C + I_2$

$Y = 10 + 0.75Y + 150 - 5i$

$0.25Y = 160 - 5i$

$IS_2 \Rightarrow \boxed{Y = 640 - 20i}$ slope = 20

~~Earlier $\frac{\Delta Y}{\Delta i} = 40$ ∴ slope $= \frac{1}{40}$~~

~~new $\frac{\Delta Y}{\Delta i} = 20$~~

~~new slope $= \frac{1}{20}$~~

Slope of IS_2 $(= .05)$ > Slope of IS_1 $(= .025)$

(since b is smaller, $\frac{1}{\alpha_G b}$ is larger)

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Q4) $C = 40 + 0.75(Y - 0.2Y)$ $\quad c = 0.75,\ b = 5$

$\bar{G} = 90$

$I = 150 - 5i$

a) Find the eqn for eqm in the gds mkt. Plot & name it IS_1.

Ans: Eqm in the gds mkt is given by the IS eqn.

In eqm,

$$Y = C + I + G \qquad t = 0.2$$

$$Y = 40 + 0.75(Y - 0.2Y) + 150 - 5i + 90$$

$$Y = 40 + 0.75(0.8Y) + 150 - 5i + 90$$

$$Y - 0.6Y = 280 - 5i$$

$$0.4Y = 280 - 5i$$

$$\rightarrow \boxed{Y = 700 - 12.5i}$$ ① shown in fig

when roi = 6%

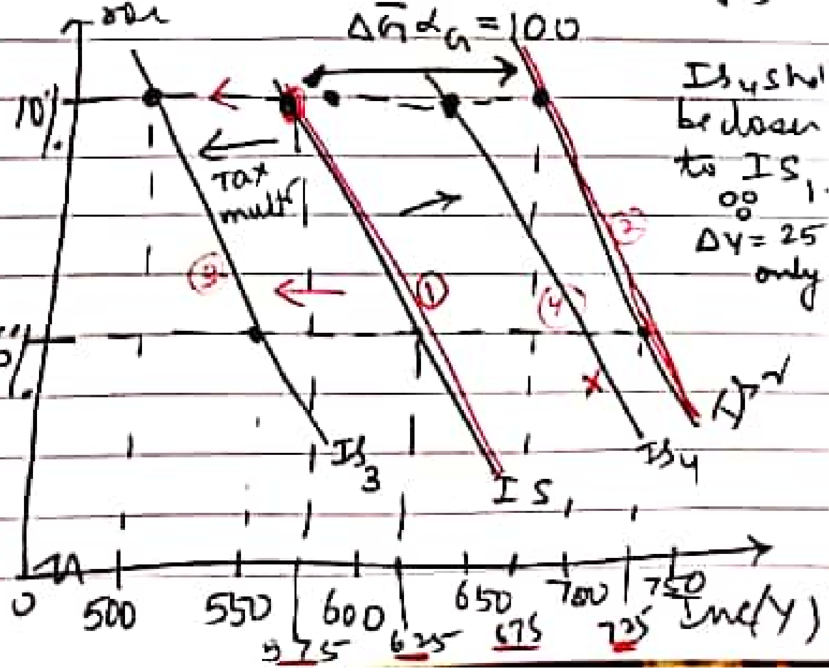
$Y = 700 - 12.5(6)$

$= 625$

when roi = 10%,

$Y = 700 - 12.5(10)$

$= ~~625~~\ 575$



IS_4 should be closer to IS_1. ∴ $\Delta Y = 25$ only

✓ $IS_1 \begin{bmatrix} i = 6\%, & Y_1 = 625 \\ i = 10\%, & Y_2 = 575 \end{bmatrix}$ $IS_2 = \begin{bmatrix} Y_1 = 625 + 100 = 725 \\ Y_2 = ~~625~~\ 575 + 100 = 675 \end{bmatrix}$ (i = 6%) (i = 10%)

(11) $IS_3 = \begin{bmatrix} Y_1 = 625 - 75 = 550 \\ Y_2 = 575 - 75 = 500 \end{bmatrix}$ i (%) (6%) (10%) $IS_4 = \begin{bmatrix} Y_1 = 625 + 25 = 650 \\ Y_2 = 575 + 25 = 600 \end{bmatrix}$ – 6% – 10%

(b) Explain the direction & magnitude of shift in the IS curve when there is

(i) Rs 40 ↑ in G

(ii) Rs 40 ↑ in taxes (TA)

(iii) Rs 40 ↑ in G & TA.

Ans: (i) $\alpha_G = \frac{1}{[1 - c(1-t)]}$ (Govt multr Eqn) using $c = 0.75$, $t = 0.2$

$\Delta Y = \alpha_G \Delta G$

$= 2.5(40)$

$= 100$

$= \frac{1}{(1-0.75)(1-0.2)} = \frac{1}{1-0.6} = \frac{1}{0.4} = 2.5$

An ↑ in G to the extent of 40 will shift the IS curve to the extent of $40(2.5) = 100$ rightwards.

– shown as IS_2. An ↑ in G ↑s auto. spending $\bar{A}$ & shifts ISC to the right $(\alpha_G \Delta\bar{A})$ (b/i)

Lump sum tax multi when t not there $= \frac{-c}{1-c}$ $\frac{\Delta Y_0}{\Delta TA} = \frac{-c}{1-c(1-t)}$

(b)(ii) Lum sum tax multiplier (t is also there)

$\frac{\Delta Y}{\Delta TA} = \frac{-c}{[1 - c(1-t)]} = \frac{-0.75}{(1-0.75)(1-0.2)}$

$= -\frac{0.75}{0.4} = -1.875$

$\Delta Y = \frac{-c}{1-c(1-t)}(40)$

$= (-1.875)(40)$

$= -75$

~~$\Delta Y = \Delta TA . \text{multi}$~~

$\Delta Y = \text{multi} . \Delta TA$

A 40 ↑ in Taxes will shift the IS curve leftwd by $40.(-1.875) = -75$. Shown as IS_3

Eqm of LM curve ⇒ $i = \frac{1}{h}\left[kY - \frac{M}{P}\right]$

(iii) A 40 ↑ in both G and TA will shift the IS curve (100 − 75 = Rs ㉕). Shown as IS_4.

100 ↓ shifts rt ∵ of ↑ in G by 40 by 100 — shift left by 75 ∵ of ↑ TA

Explanⁿ: ∵ of ↑ in G by 40, IS curve shifts to the rt by 100

& ∵ of ↑ in TA by 40, IS curve shifts to the left by 75.

∴ [IS curve shifts to the rt. by 100 − 75 = Rs 25] (ΔY = 25 as qst to ①)

(Q5) $L = 0.2Y - 5i$ — dd for real bals. $L = kY - hi \Rightarrow k = 0.2,\ h = 5$

$\overline{M}$ (nominal money ss) = 150

Derive LM curve.

Ans. Eqm in the money mkt is attained when dd for real balances is = real money ss. We ass. that pr level remains constant.

∴ Eqm is attained when (since P is not given, equate L to nom. money ss)

$L = \overline{M}$

$0.2Y - 5i = 150$

$0.2Y = 150 + 5i$

$Y = 750 + 25i$ This is eqⁿ of the LM curve (Y as a fn of the roi)

⑬ ~~$Y = 750 + 25i$ $\Rightarrow 25i = 750 - Y$ $i = \frac{750}{25} - \frac{1}{25}Y$ $\Rightarrow i = 30 - \frac{1}{25}Y$~~

Ass. int rates of 4% & 8%

{i = 4%, Y = 850}

when ri = 4%, $Y = 750 + 25(4)$
$= 750 + 100 = \underline{\underline{850}}$

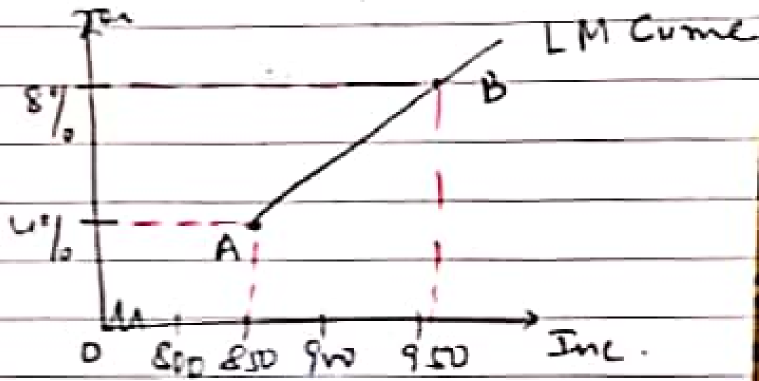
Let this be pt. A.

{i = 8%, Y = 950}

when ri = 8%, $Y = 750 + 25(8) = \underline{\underline{950}}$

Let this be pt B. Plot these pts.

So we get upward sloping LM curve



Q6) $L = 0.20Y - 5i$ $\Rightarrow k = 0.2,\ h = 5$
$\bar{M} = 200$

Plot LM curve what happens to the LM curve when there is a Rs 10 ↑ in money supply.

Ans: ~~Eq^m in the money mkt is attained~~ when $L = \bar{M}$

$L = \bar{M}$

ie $0.20Y - 5i = 200$
$0.2Y = 200 + 5i$
$\boxed{Y = 1000 + 25i}$ — Eq^n of LM curve

Plot it in the fig

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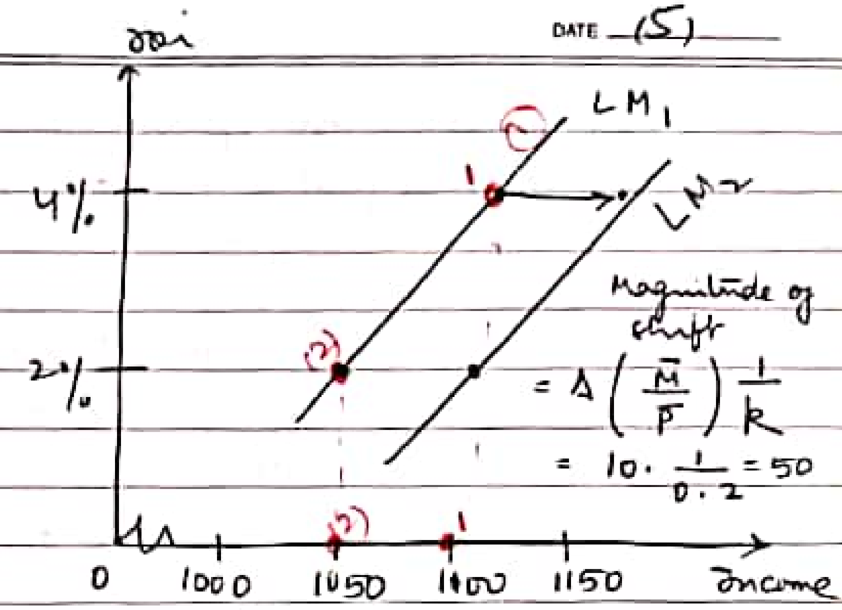
$Y = 1000 + 25i$ - LM_1
$Y = 1050 + 25i$ - LM_2

(14)

From the desk of DATE (5)

when roi = 4%,
i ↓s $Y = 1000 + 25(4)$
$= 1100$

when roi = 2%,
$Y = 1000 + 25(2)$
Y ↓ $= 1000 + 50$
$= 1050$



Magnitude of shift
$= \Delta\left(\frac{\bar{M}}{P}\right)\frac{1}{k}$
$= 10 \cdot \frac{1}{0.2} = 50$

Now there is a Rs 10 ↑ in the money ss.
$\bar{M}^* = 4210$ So, now $\bar{M}^* = 210$.
New eqm in the money mkt is attained when $L = \bar{M}^*$
$\Rightarrow 0.2Y - 5i = 210$

LM_2 $\boxed{Y = 1050 + 25i}$ - Eqn of LM_2 C

when roi = 4%, $Y = 1050 + 25(4)$
$= 1050 + 100 = 1150$

i ↓s Y values ↓s
$\left\{ i = 4\%, \; y = 1150 \right\}$
$\left\{ i = 2\%, \; Y = 1100 \right\}$

when roi = 2%, $Y = 1050 + 25(2)$
$= 1050 + 50 = 1100$.

The LM curve shifts parallel rtwards & the magnitude of shift is

$$\left[\Delta\left(\frac{\bar{M}}{P}\right) \cdot \frac{1}{k}\right] = \left[10 \times \frac{1}{0.2}\right] = 50$$

$\rightarrow \Delta Y = \frac{1}{k} \Delta M = 50$

given & since k is given, k is constant

Slope of LM = $\frac{k}{h}$

LM$_1$ & LM$_2$ are parallel ∴ they've the same slope $\left(\frac{k}{h}\right) \cdot \left(\frac{0.2}{5}\right) = \underline{\underline{0.04}}$ $\frac{20}{50} = .04$

[illegible]

Q7) Given

$$C = 100 + 0.8Y \qquad mpc = 0.8$$
$$I = 150 - 6i \qquad b = 6$$
$$\bar{M} = 150$$
$$L = 0.2Y - 4i$$

Find the ~~eqm~~ roi & ~~eqm~~ level of income at wh. there is simul. eqm in the gds & money mkt. Show the result graphically by plotting IS - LM curves.

Sol- Eqm in the gds mkt is represented by IS curve. The eqn for IS curve will be

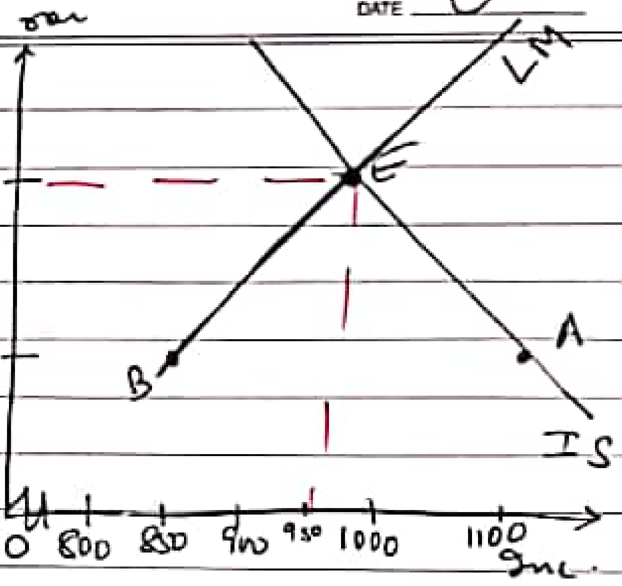
$$Y = C + I$$
$$= 100 + 0.8Y + 150 - 6i$$
$$0.2Y = 250 - 6i$$
$$\boxed{Y = 1250 - 30i} \quad (\text{IS eq}^n)$$

Plot IS curve using 5% & 10% int rate

Points	roi	$Y = 1250 - 30i$
A	5%	$Y = 1250 - 30(5) = \underline{1100}$ ↓
E	10% ↑	$Y = 1250 - 30(10) = \underline{950}$

Assm: P is ↔

Eqm in the money mkt will be repd by the LM curve. The eqn for the LM curve will be $L = \overline{M}$.



ie $0.2Y - 4i = 150$

$0.2Y = 150 + 4i$

$\boxed{Y = 750 + 20i}$

Plot LM curve using 5% & 10% roi.

Pts.	roi	Y = 750 + 20i
B	5%	Y = 750 + 20(5) = 850
E	10% ↑	Y = 750 + 20(10) = 950 ↑

Eqm is attained at pt E where IS & LM curves intersect.

Mathematically, simultaneous eqm in the gds & money mkt is attained when IS = LM. (IA) (ie at the (LM) pt of intersection)

ie $1250 - 30i = 750 + 20i$

$\Rightarrow 500 = 50i$

$\boxed{i = 10\%}$ Subst i = 10%, in LM Eqn

when i = 10%, $0.2Y - 4i = 150$ or $\left[Y = 750 + 20(10) = 950. \right.$

$0.2Y - 4(10) = 150$

$0.2Y = 190 \Rightarrow Y = 950$

So when $i = 10\%$, $Y = 950$ Eqm rai & inc are 10% and 950.

(Q8) Given $C = 100 + 0.8\,YD$

$I = 150 - 6i$

$TA = 0.25Y$

$\bar{G} = 100$

$L = 0.2Y - 2i$

$\bar{M} = 150$

mpc = 0.8

b = 6

t = 0.25

k = 0.2, h = 2

Find eqm rai & eqn level of income at wh there is a simul. eqm in the gds & money mkt. Show your result graphically by plotting the IS-LM curves.

Ans. Eqm in the gds mkt is repd by IS curve. The eqn of IS curve'll be

$Y = C + I + G$

tY TR=0

$Y = 100 + 0.8(Y - 0.25Y) + 150 - 6i + 100$

$Y = 100 + 0.8(0.75Y) + 150 - 6i + 100$

$Y - 0.6Y = 350 - 6i$

$\boxed{Y = 875 - 15i}$ (IS eqn)

Eqm in the money mkt is repd by LM curve. The eqn for the LM curve'll be $L = \bar{M}$

ie $0.2Y - 2i = 150$

$0.2Y = 150 + 2i \Rightarrow \boxed{Y = 750 + 10i}$ (LM eqn)

Eqm 'll be attained when $IS = LM$

$$875 - 15i = 750 + 10i$$

$$125 = 25i$$

$$\boxed{i_0 = 5\%}$$

Eqm roi = 5%. Eqm level of inc. 'll be

$$Y = 875 - 15i$$

$$Y = 875 - 15(5)$$

$$Y = 875 - 75 = \boxed{800}$$

Plotting of IS Curve

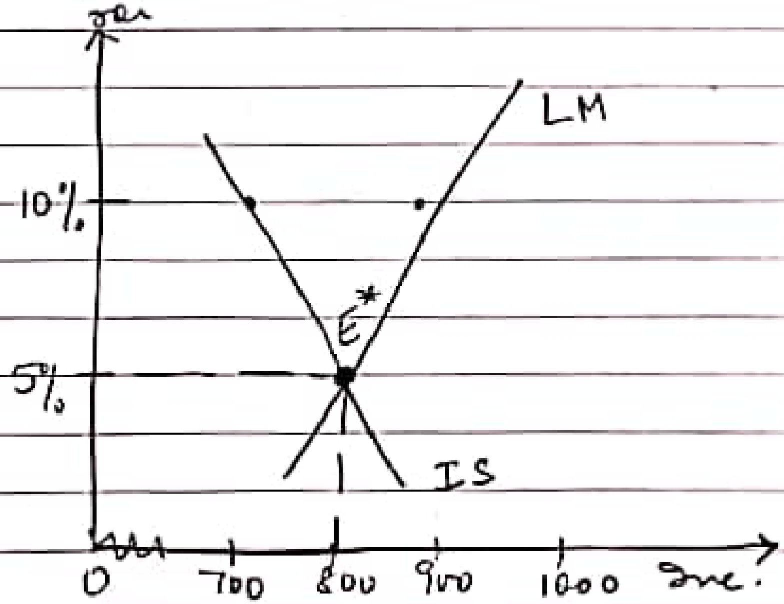
IS Eqn: $Y = 875 - 15i$

So, when roi = 5%,

$$Y = 875 - 15(5)$$
$$= 800$$

when roi = 10%,

$$Y = 875 - 15(10)$$
$$= 875 - 150$$
$$= 725$$



Plotting LMC

LM Eqn: $Y = 750 + 10i$

when roi = 5%, $Y = 750 + 10(5) = 800$

when roi = 10%, $Y = 750 + 10(10) = 850$.

Pgs of my notes (23 & 24 not there in Course) 28

From the desk of

DATE 25

A formal Algebraic treatment of the IS – LM Model

– Algebraic derivation of eqm in the goods & money mkt & derivation of the AD curve equation.

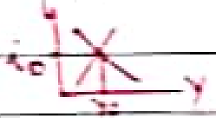
IS-LM Simultaneous eqm in the gds & money mkt is attained at the intersection of the IS and LM schedules. This determines eqm income & the eqm roi.

The eqm in the gds mkt is expressed by the IS curve:

$$\underline{\underline{IS}} : \; y = \alpha_G (\bar{A} - b i) \qquad (5)$$

The eqm in the money mkt is expressed by the LM curve:

$$\underline{\underline{LM}} : \; i = \frac{1}{h}\left[kY - \frac{\bar{M}}{\bar{P}} \right] \quad — \quad (7a)$$



Eqm income & Eqm roi is detd where IS = LM. The same roi & inc. levels ensure eqm in both the gds & the money mkt. In terms of eqns that means we can substitute the int. rate from the LM eqn (7a) into IS eqn (5).

Subs^g eq^n (7a) in (5), we obtain

$$Y = \alpha_G \left[\bar{A} - b\frac{1}{h}\left(kY - \frac{\bar{M}}{\bar{P}}\right) \right]$$

$$Y = \alpha_G \bar{A} - \frac{b\alpha_G}{h}\left(kY - \frac{\bar{M}}{\bar{P}}\right)$$

Multiplying both sides by h,

$$hY = \alpha_G \bar{A} h - b\alpha_G kY + b\alpha_G \frac{\bar{M}}{\bar{P}} \quad (h \text{ cancelled})$$

$$hY + b\alpha_G kY = \alpha_G \bar{A} h + b\alpha_G \frac{\bar{M}}{\bar{P}}$$

$$[h + b\alpha_G k](Y) = \alpha_G h \bar{A} + b\alpha_G \frac{\bar{M}}{\bar{P}}$$

$$(Y) = \frac{\alpha_G h.\bar{A} + b\alpha_G \frac{\bar{M}}{\bar{P}}}{[h + b\alpha_G k]} \leftarrow \text{[illegible]}$$

with some manipulation & Solving for Eq^m level of inc, we obtain

$$Y = \frac{h\alpha_G}{h + kb\alpha_G}\bar{A} + \frac{b\alpha_G}{h + kb\alpha_G}.\frac{\bar{M}}{\bar{P}} \quad ⑧$$

$$\text{or,} \quad Y_0 = \gamma \bar{A} + \gamma \frac{b}{h} \frac{\bar{M}}{\bar{P}} \quad \text{Eq}^n\ 12 \quad (8a)$$

where $\gamma = \dfrac{\alpha_G}{(1 + \underbrace{k\alpha_G b/h}_{\text{only } bk\alpha_G \text{ is } \div d \text{ by } h.})} \rightarrow \text{Denom}^r = \dfrac{h + kb\alpha_G}{h} \implies \text{numerator} = \dfrac{h}{h + kb\alpha_G}$

For $\gamma = \dfrac{h\alpha_G}{h + k\alpha_G b} \longrightarrow$ better

Eqn (8) shows that the eqm level of income depends on 2 exogeneous vars:

(1) Auton. spending ($\bar{A}$), including auton. Cn and Inv ($\bar{C}$ & $\bar{I}$) and fiscal policy parameters ($\bar{G}$, $\bar{TR}$), and

$A = \bar{C} + c\bar{TR} + \bar{I} + \bar{G}$

(2) The real money stock ($\bar{M}/\bar{P}$). Eqm inc is hr. the hr. the level of auton. spending $\bar{A}$, & the hr. the stock of real balances

AD curve Eqn (8) is also the mathematical relnship between pc level & eqm o/p (= inc = Y). It is ∴ the eqn of the AD curve. It shows the relnship bet. Y and P for given level of $\bar{A}$) and ($\bar{M}$). Since P is in the denominator, the agg DC slopes dwd.

Non recess:→ (SRE) ((The eqm rai, i_0, is obtd by substituting the eqm inc. level, Y_0, from eqn (8) into the eqn of the LM schedule (7a)) $i = \frac{1}{h}\left[kY - \frac{\bar{M}}{\bar{P}}\right]$

$i_0 = \frac{k}{h}\gamma\bar{A} - \frac{1}{h+kb\alpha_G}\frac{\bar{M}}{\bar{P}}$)) (9)

$$i = \frac{k\alpha_G}{h+kb\alpha_G}\bar{A} - \frac{}{h+kb\alpha_G}\frac{\bar{M}}{\bar{P}} \qquad (9)$$

or $$i = \gamma\frac{k}{h}\bar{A} - \gamma\frac{1}{h\alpha_G}\frac{\bar{M}}{\bar{P}} \qquad (9a)$$

where $\gamma = \frac{h\alpha_G}{h+kb\alpha_G}$.

$\rightarrow L = kY - hi \rightarrow \frac{\Delta L}{\Delta i}$ $\frac{\Delta L}{\Delta Y}$

$\rightarrow I = \bar{I} - bi$ $\frac{\Delta I}{\Delta i} = b$ $\alpha_G = \frac{1}{1-c(1-t)}$

(22)

① h, k, b, ^c ② ↑ ② ↑

Eqn (9) shows that the eqm rai depends on the parameters of fiscal policy captured in the multiplier & the term $\bar{A}$ & on the real money ~~[illegible]~~ stock. A hr. real money stock implies a lower eqm int. rate.)

Let us now find out the precise relation bet. changes in fiscal policy or changes in the real money stock & the resulting changes in eqm income. This information is provided by the Monetary & Fiscal Policy multipliers.

i Hr. $\bar{A}$ ⇒ hr income ⇒ hr dd for real bals (L) ⇒ $D_M > S_M$ ie EDM ⇒ hr rai. (needed to reduce D_m)

So hr $\bar{A}$ ⇒ hr rai (+ve relation)

Also, hr is $\frac{\bar{M}}{P}$, ESM ⇒ $S_m > D_M$, so to ↑ D_m, rai must fall.

h + + + → better

$$* \left[\begin{array}{l} \bar{A} = \bar{C} + c\bar{TR} + \bar{I} + \underline{\bar{G}} \\ \therefore \quad \Rightarrow \Delta\bar{G} = \Delta\bar{A} \text{ (other components don't } \Delta e \therefore \Delta = 0 \text{)} \end{array} \right.$$

㉓ (32)

From the desk of

The Fiscal Policy Multiplier

DATE (27)

- The multiplier effect of fiscal policy in an IS - LM framework.

The fiscal policy multiplier shows the change in eqm level of income, due to a change in govt spending, holding the real money ss constant. (In prev chp, seen Keynes model, $\alpha_G = \frac{1}{1-c(1-t)}$

We know that

$$\gamma = \frac{h\alpha_G}{h + bk\alpha_G}$$

$$Y = \frac{\alpha_G h . \bar{A} + b\alpha_G \frac{\bar{M}}{\bar{P}}}{[h + b\alpha_G k]} \Rightarrow Y_0 = \overset{\to\, \text{gamma}}{\gamma} \bar{A} + \gamma \frac{b}{h} \frac{\bar{M}}{\bar{P}} \quad 8(a) \, *$$

$$\frac{\Delta Y_0}{\Delta \bar{A}} = \gamma = \frac{\Delta Y_0}{\Delta \bar{G}} \, *$$

$\bar{G}$ ↑es, $\bar{A}$ ↑

Let there be an ↑ in Govt. spending, $\Delta\bar{G}$ (wh. is a Δe in auton. spending $\Delta\bar{A}$).

$* \; \Delta\bar{A} = \Delta\bar{G}$

(ie $\Delta \bar{A} = \Delta \bar{G}$ *)

$$\text{Mult} = \frac{\Delta Y}{\Delta \bar{G}} = \frac{\Delta Y}{\Delta \bar{A}}$$

The effect of the Δe in $\bar{G}$ is given by:

$$* \; \frac{\Delta Y_0}{\Delta \bar{G}} = \gamma \quad \text{where } \gamma = \text{~~[illegible]~~}$$

or ~~[illegible]~~

$$\frac{\Delta Y_0}{\Delta \bar{G}} = \frac{h\alpha_G}{h + b\alpha_G k} \qquad \text{Let } \gamma = \frac{h\alpha_G}{h + b\alpha_G k}$$

$b = \frac{\Delta I}{\Delta i} < 0$

h = sensitivity of dd for real bals to rei

k = " " " " real income

$$\text{So } \boxed{\frac{\Delta Y_0}{\Delta \bar{G}} = \gamma}$$

The expression 'γ' is the

→ fiscal or govt spending mult^r once the int. rate adjustment is taken into a/c. So 'γ' takes into consideration

→ $\Delta \bar{G} \uparrow$, $\bar{A} \uparrow$, $AD \uparrow$, $Y \uparrow$, $L \uparrow$, EDM (M/P is fixed), $i \uparrow$, $I \downarrow$ $AD \downarrow$ $Y_0 \downarrow$

This dampening not there in Keynes model

(24)

int. rate adjustments. whereas, α_G is the multr that applied under constant int. rates. $\left[\alpha_G = \frac{1}{1-c(1-t)} \right]$ $\Delta \bar{G} \uparrow$, $\bar{A} \uparrow$ $AD \uparrow$, $Y_0 \uparrow$. (no ↑ in i for real bals after this)

(roi didn't appear in the model of ch 9).

The value of γ will be less than α_G,

$\gamma = \frac{h\alpha_G}{h+b\alpha_G k}$ Dividing both numr denor by h, we get →

γL^{+G}

$$\gamma = \frac{\frac{h\alpha_G}{h}}{\frac{h+b\alpha_G k}{h}}$$

$$\gamma = \frac{\alpha_G}{1+\frac{b\alpha_G k}{h}} = \frac{1}{1+\frac{b\alpha_G k}{h}} \cdot \alpha_G$$

$$\gamma = \underbrace{\frac{1}{1+\frac{b\alpha_G k}{h}}}_{<1} \cdot \alpha_G < \alpha_G$$ Now, $\frac{1}{1+\frac{b\alpha_G k}{h}} < 1$

it's a fraction $\left(1+\frac{bk\alpha_G}{h} > 1\right)^h$

∴ γ will be $< \alpha_G$.

This represents the dampening effect of the int. rates assoc'd with a fiscal expansion in the IS-LM model i.e. when $\bar{G} \uparrow$, $\bar{A} \uparrow$, $AD \uparrow$ $\boxed{Y \uparrow}$ after money, i. EDM, [illegible] int. $\boxed{\downarrow Y}$

$$\gamma = \frac{h\alpha_G}{h+b\alpha_G k}$$ $\boxed{\text{SLOPE of the LM}}$

if $h \to 0$ ⇒ $\frac{k}{h} \to \infty$ $\gamma = \frac{0}{\infty}$

[illegible]

γ is almost zero if h is v small/zero it will lead to a vertical LM curve.

(no ↑ in income due to ↑ in $\bar{G}$)

If h approaches infinity, then $\gamma = \alpha_G$ and (slope = 0)

Shown Earlier (no dampening effect if LM is horiz) [illegible]

As h → 0, r → 0   h ↑, r ↑
As h → ∞, r = α_G

will lead to a horizontal LM curve||

α_G & $\frac{\Delta L}{\Delta i} = h$ ↗ ||An ↑ in the govt multiplier α_G and the interest sensitivity of the dd for money 'h' results in a larger value of γ||

b & k one in the denom ↗ $\frac{\Delta L}{\Delta Y}$ ↗ Why. ||A large value of 'b' or 'k' will reduce the value of γ, thus reducing the multiplying effect that a Δe in govt spending has on o/p.|| This is ∵ a high value of 'k' ⇒s a large ↑ in money dd as income rises and hence a large ↑ in int. rates reqd to maintain money mkt eqm. In combn with a high 'b', this ⇒s a large redn in that agg. dd due to a large fall in Inv (ie further a high value of 'b' would lead to a large fall in Agg dd).

✓|| ✓{ b = sensitivity of Inv to r $I = \bar{I} - br$ $\frac{\Delta I}{\Delta r} = -b$

k = sensitivity of dd for money to income $L = kY - hi$

High k ⇒ As Y ↑es, money dd rises a lot ∴ there is excess dd of money ⇒ large ↑ in r reqd to remove exc D_m & bring eqm in the money mkt

& Since b is high ⇒ Inv is v. sensitive to r

∴ Inv & AD ↓ a lot; }
∴ Ys ↓ a lot.

→

'The Monetary Policy Multiplier'

— the multiplier effect of monetary Policy in an IS-LM framework.

{ The monetary policy multiplier shows the change in eqm level of income due to a change in real money supply, keeping fiscal policy unchanged.))

→

We know that $Y = \dfrac{\alpha_G h . \bar{A} + b\alpha_G \frac{\bar{M}}{\bar{P}}}{[h + b\alpha_G k]}$

Real m-ss: $\frac{\bar{M}}{\bar{P}}$ res

[[Let there be an ↑ in real money supply $[\Delta(\bar{M}/\bar{P})]$ $Y_0 = \frac{h\alpha_G}{h+kb\alpha_G}\bar{A} + \frac{b\alpha_G}{h+kb\alpha_G}\bar{M}/\bar{P}$

$$\frac{\Delta Y}{\Delta(\bar{M}/\bar{P})} = \frac{b\alpha_G}{h + b\alpha_G k} = \frac{b}{h}\gamma \quad]]$$

b = sensit of Inv. to roi
h = sensiv of L to roi

A large value for the govt multr

α_G
b

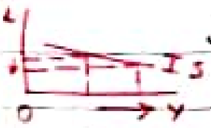
{ 'α_G' and a large value of interest sensitivity of Inv t 'b' increases the multiplying effect of a change in real money supply on income (or R/P).

→

This is ∵ an ↑ in α_G and/or 'b' reduces the slope of the IS curve.

Slope of IS C = $\frac{1}{b\alpha_G}$

The IS curve becomes flatter. This ⇒s that interest rate change resulting from a change in the real money ss will finall



↑ in real mony ss → ESM → ↓ roi → ↑ Inv (lot of) → ↑ Y (lot of) (∵ h high) → (∵ of flatter IS curve small b, large A in Y)

result in greater effect on inc. (or o/p). We can thus say that when IS has a smaller slope (ie it is flatter), a real money ss change has a greater multiplying effect on income {✓ As $\frac{\bar{m}}{p}$ ↑, there is ESM, $D_m < S_m$, people buy bonds with money, P_B ↑, roi ↓, Inv ↑es a lot, Y ↑es a lot (∵ b large)}

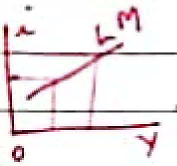
(P_B ↑ D_m, roi must fall)

An ↑ in the sensitivity of dd for real balances to income 'k', and an ↑ in the sensitivity of dd for real balances to int. rate 'h', will reduce the multiplying effect of a money ss change on income (or o/p). This is ∵ an ↑ in 'h' or an ↑ in 'k' decreases the slope of the LM curve (the LM curve becomes flatter) resulting in a real money ss change leading to a small change in the roi. A smaller sloped LM curve leads to a lesser multiplying effect of a real money money ss change on inc (or o/p). *

↑ k & ↑ h

slope = $\frac{k}{h}$

Flatter LM curve



((A ↓ in h & k, will ↑ the effect of $\Delta M/P$ on income))

End {Conclusion : The smaller h & k and the larger b and α_G, the more expansionary the effect of an ↑ in real balances on the eqm level of income//. Large b & α_G correspond to a very flat IS schedule (∵ slope of IS curve = $\frac{1}{b.\alpha_G}$).

*{— Smaller h ⇒ dd for real bal(a)ces not v. sensitive to roi, ~~and income~~ so as M_S ↑, ESM, roi ↓ (toL ↑) I↑, inc. ↑s a lot ⇒ multr is large