Savings Market

$$\left.\begin{aligned} S &\equiv Y_D - C \\ Y_D &= Y - T \end{aligned}\right\}$$

$\rightarrow \quad S = Y - T - C$

G.M. Eqm: $\quad Y = C + I + G$

$$\Longleftrightarrow \quad \underbrace{Y - C - T}_{\text{Savings}} = \underbrace{I}_{\text{Private}} + \underbrace{G - T}_{\text{Public Savings}}$$

if $G = T$

then in equilibrium

$$\boxed{\text{Savings} = \text{Investment}}$$

$\rightarrow$ Savings market is in Eqm.

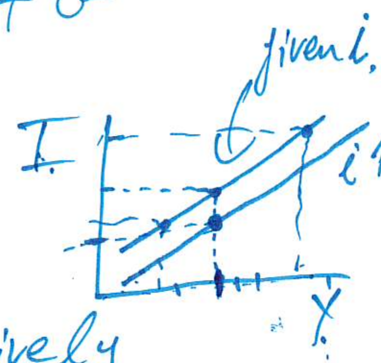
$$\rightarrow \quad \underbrace{Y - C - T}_{\text{Private Savings}} + \underbrace{T - G}_{\text{Public Sav.}} = \underbrace{I}_{\text{Investment}}$$

$\hookrightarrow$ Savings = Investment

<u>When $Y = Z$</u> and vice versa.

C.M. Eqm: $Y = C(Y,T) + I + G$

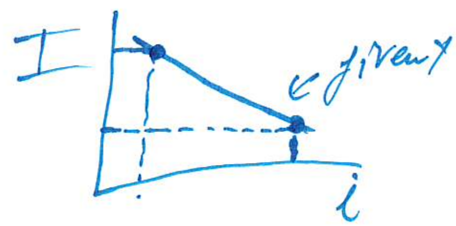
↳ Y^*



Assume: • I depends on Y. ← Positively

• I depends on i: interest Rate

↳ Negatively



$I(Y,i)$: $\frac{\partial I(Y,i)}{\partial Y} > 0$. for all (Y,i)

$\frac{\partial I(Y,i)}{\partial i} < 0$ " " (Y,i).

↳ change in I when i increases is negative holding every else constant.

$I(\underset{(+)}{Y},\underset{(-)}{i})$

Now G.M. eqm:

$$\begin{cases} Y = C(Y,T) + I(Y,i) + G \\ C(Y,T) = c_0 + c_1(Y-T) \\ I(Y,i) = d_0 \cdot Y - d_1 \cdot i \\ d_0, d_1 > 0. \end{cases}$$

$$\Rightarrow Y^* = c_0 + c_1 \cdot Y^* - c_1 \cdot T + d_0 \cdot Y^* - d_1 \cdot i + G$$

$$\Leftrightarrow Y^*(1-c_1-d_0) = c_0 - c_1 \cdot T - d_1 \cdot i + G$$

$$\Leftrightarrow Y^* = \underbrace{\left(\frac{1}{1-c_1-d_0}\right)}_{\substack{\text{Multiplier} := m \\ (+)}} \cdot \underbrace{\left[c_0 - c_1 \cdot T - \underset{(-)}{d_1 \cdot i} + G\right]}$$

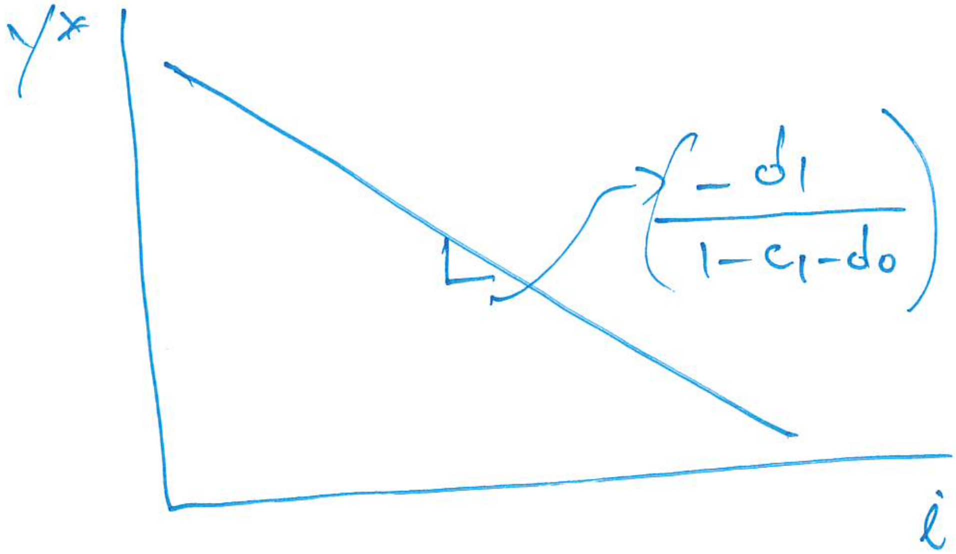
IS Relation

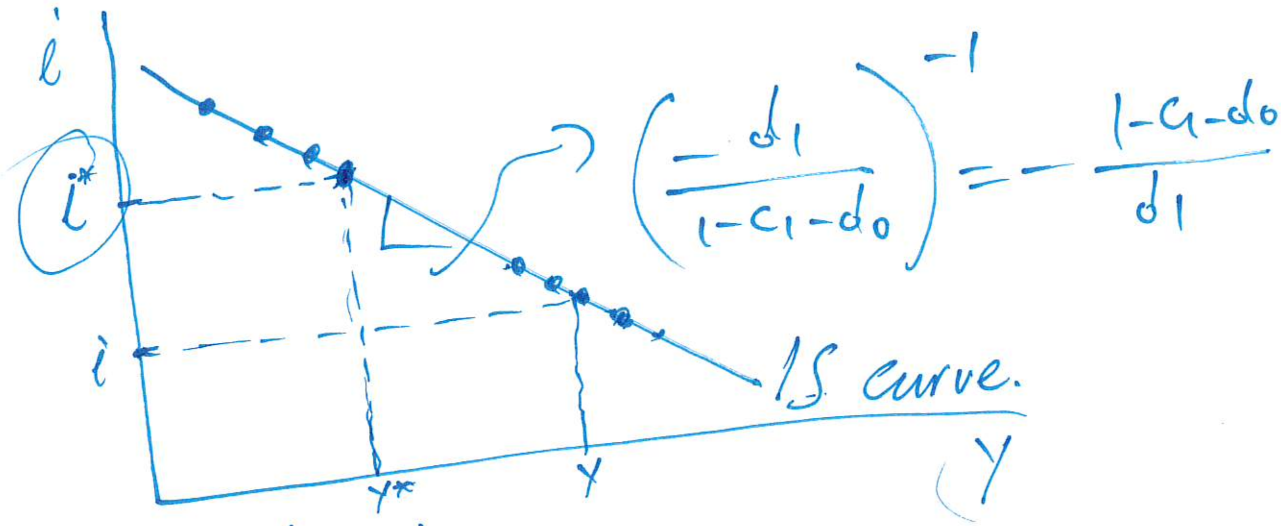
* Assume: $0 < 1 - c_1 - d_0 < 1 \Rightarrow \boxed{m > 1}$

Result: Y^* depends negatively on i (IS condition)

if $i \uparrow$ by 1 unit ; $Y^* \downarrow$ by $d_1 \cdot m$ units

$\left(\frac{d_1}{1-c_1-d_0}\right)$ units.





Pairs (i, Y)

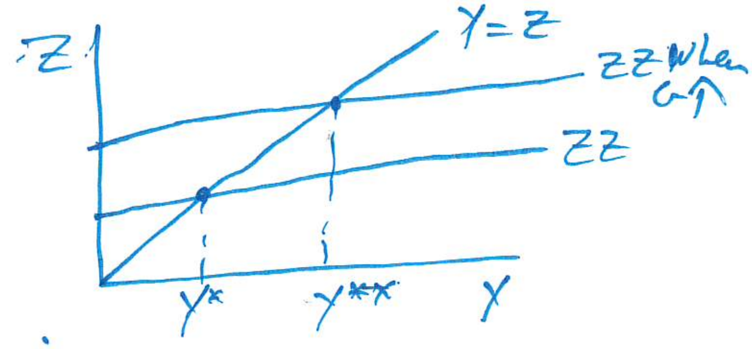
What happens to the IS curve when G or T change?

Rewrite the I.S relation As:

$$Y^* = \underset{\uparrow}{m} \cdot c_0 - \underset{\uparrow}{m} \cdot c_1 \cdot T - \underset{\uparrow}{m} \cdot b_1 \cdot i + \underset{\uparrow}{m} \cdot G$$

What happens to Y^* if $G\uparrow$, Ceteris Paribus?

Y^* goes up!

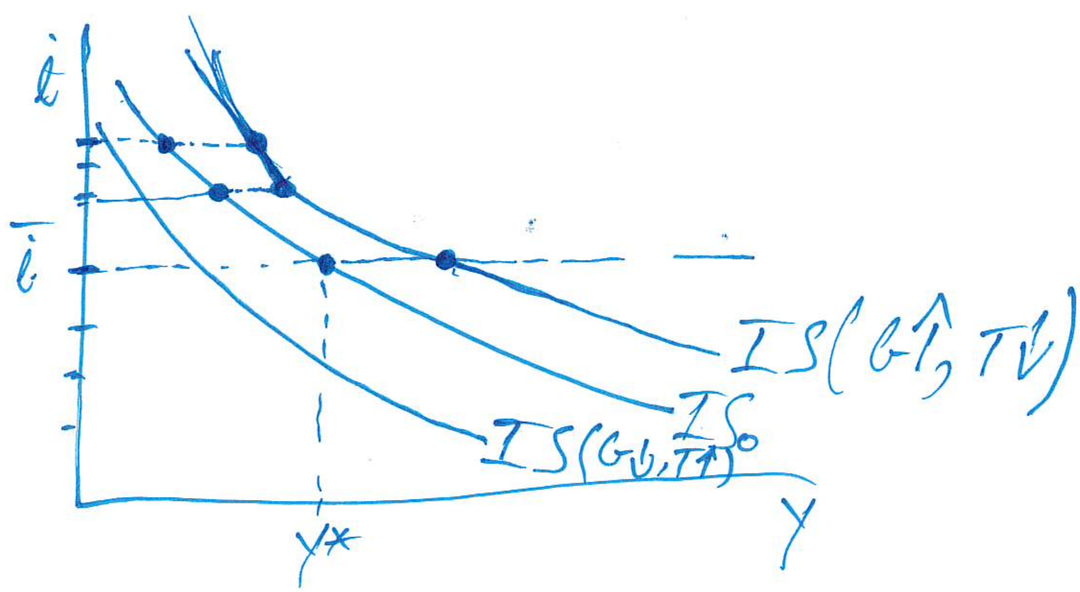


For any given value of i,

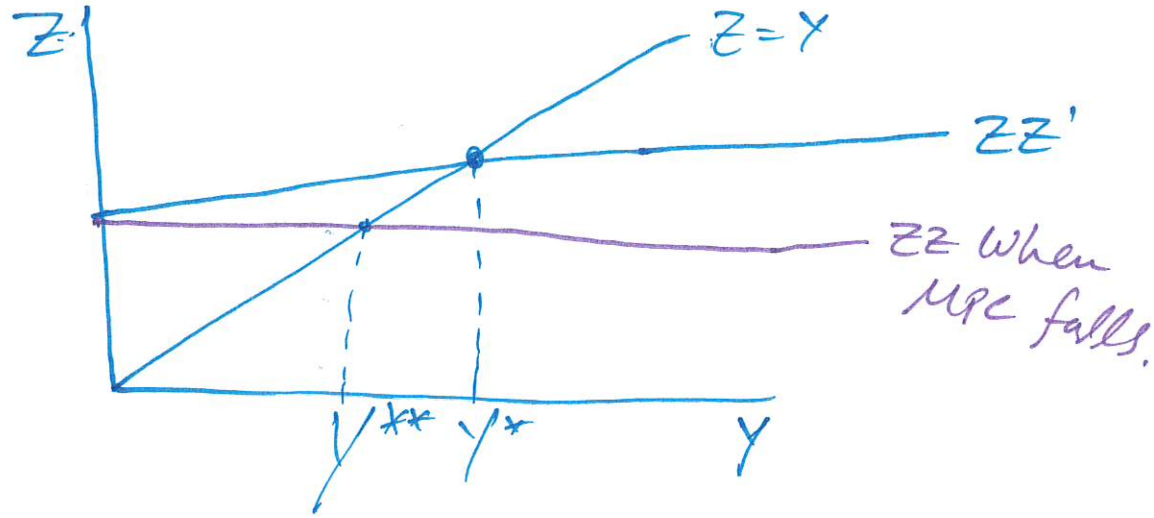
$Y^*\uparrow$ when $G\uparrow$ and vice versa $(+)$

and $Y^*\downarrow$ when $T\uparrow$. -"- $(-)$

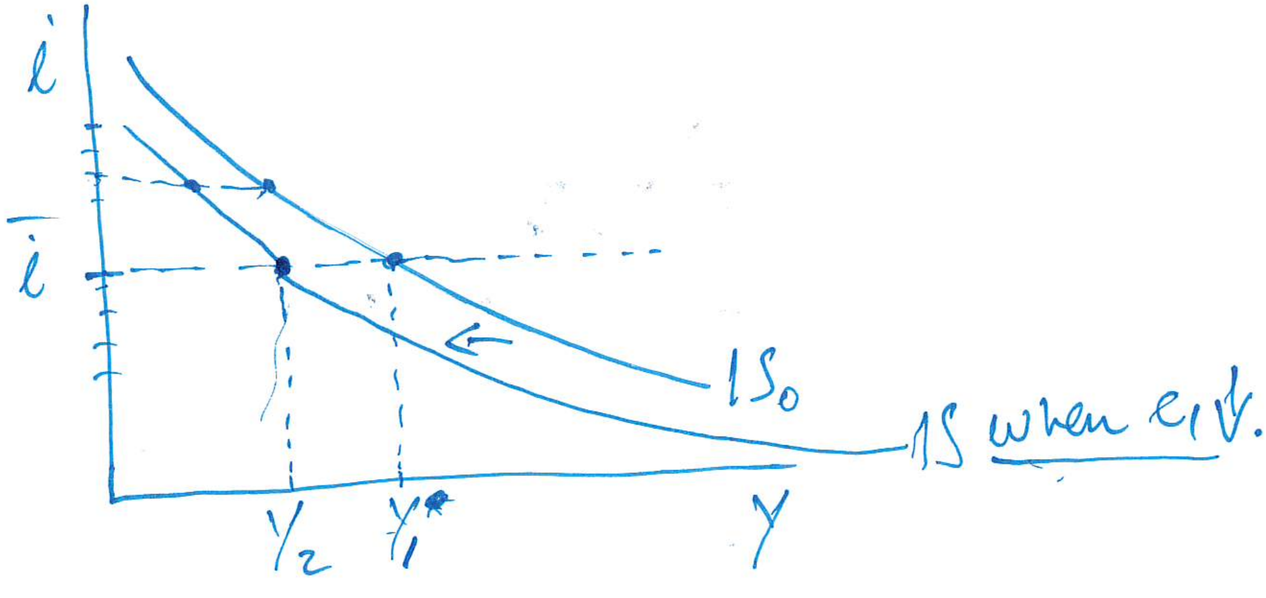
Graphically



E.g. S'pose C is hit by a negative shock and MPC $= c_1$ falls.



$\hookrightarrow$ Y^* falls given i.



Determination of i $\leftarrow$ Financial Market

Financial Markets: Money and Bonds

1) Money → Can be used in transactions
→ Pays zero interest.

2) Bonds → Cannot be used for transactions
→ Pay a positive interest $i > 0$.

↓

IOU

Consumers: Wealth $\xrightarrow{\text{demand for}}$ Money
$\xrightarrow{\text{demand for}}$ Bonds.

} choice depends on i.

{ i: Opportunity Cost of Holding Money. }

↓

Demand for Money depends on i.
(negatively)

Money Market

Central Bank controls the Nominal Money Supply

$M^s \Leftarrow$ Money Supply in Dollars.

Real Money Supply: $\frac{M^s}{P}$, P: Per-unit price of Y.

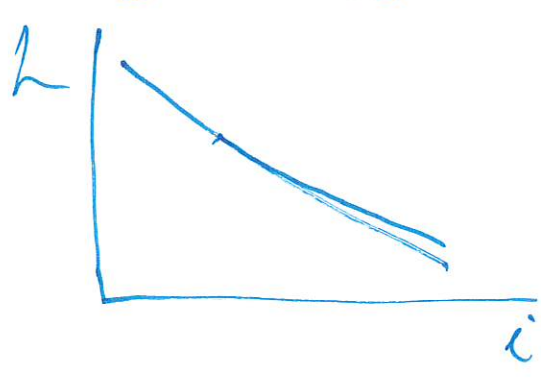
eg. $M^s = \$15,000$; $P = \$2000/\text{car}$

Real $M^s = \frac{M^s}{P} = \frac{\$15,000}{\$2,000/\text{car}} = 7.5$ cars.

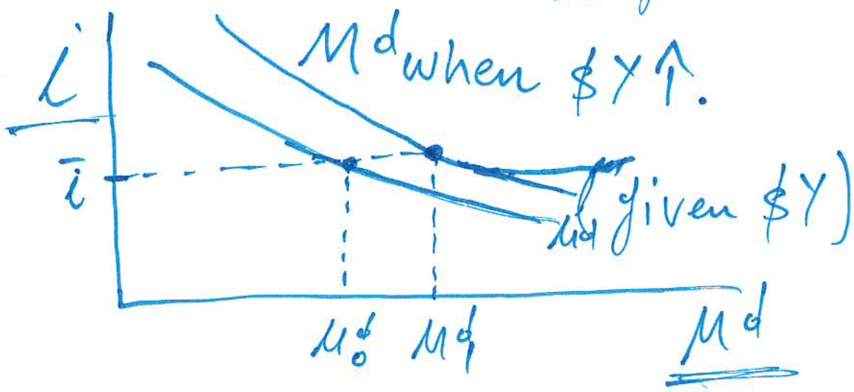
In eqm (M.M.): eqm Condition $\boxed{M^s = M^d}$ → Money Demand.

Money Demand (Assumption): $M^d(\underset{(+)}{\$Y}, \underset{(-)}{i}) = \underline{\$Y} \cdot \underset{(-)}{L(i)}$

where $L(i)$ is decreasing in i



Thus $M^d(\$Y, i)$ depends positively on $\$Y$ and negatively on i. (by assumption)



Back to M.M. eqm. Condition:

$$M^s = M^d(\$Y, i)$$

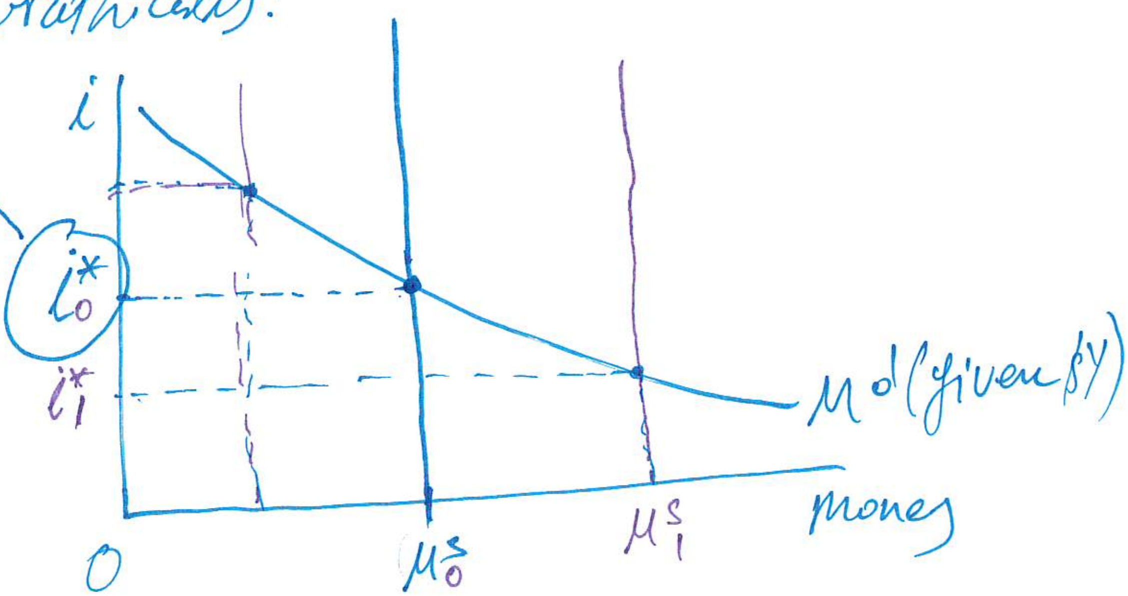
$$\Leftrightarrow \boxed{M^s = \$Y \cdot L(i)}$$

Note: Liquidity.

$$L = \frac{M^s}{\$Y} = \frac{\text{money circulated}}{\text{nominal output}}$$

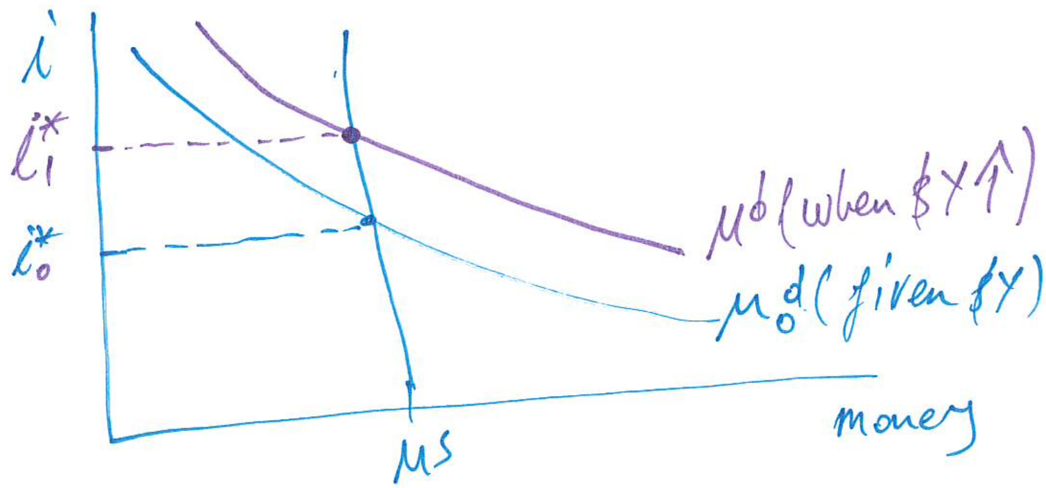
M.M. eqm. Graphically:

i^* clears the money market given M^s and $\$Y$.



$M^s \uparrow$ then i^* falls, ceteris paribus } given \$Y
$M^s \downarrow$ then i^* increases, -u-

Relation b/w \$Y and i^*?



using the mm. e/m condition

determines i^* ← $\boxed{M^s = \$Y \cdot L(i)}$ → Hold M^s constant
→ How does i^* chge in response to chges in \$Y?

S'pose \$Y ↑ → RHS ↑
LHS is fixed so $L(i)$ must fall for RHS to go back ↓.
Recall that $L(i)$ is a decreasing fn.

→ i should ↑.

Result: $Y and i^* are Positively Related!

What about $\boxed{\text{Real}}$ GDP and i^*?

$$\left.\begin{array}{l} \text{eqm} \quad M^S = \$Y \cdot L(i) \\ \$Y \equiv P \cdot Y \end{array}\right\}$$

$$\Rightarrow M^S = P \cdot Y \cdot L(i)$$

$$\Rightarrow \underbrace{\frac{M^S}{P}}_{\substack{\text{Real} \\ M^S}} = \underbrace{Y \cdot L(i)}_{\substack{\text{Real} \\ M^d}}$$

$\frac{M_0^S}{P}$ $\quad \frac{M_1^S}{P}$ $\quad M_1^S > M_0^S$

Same results:

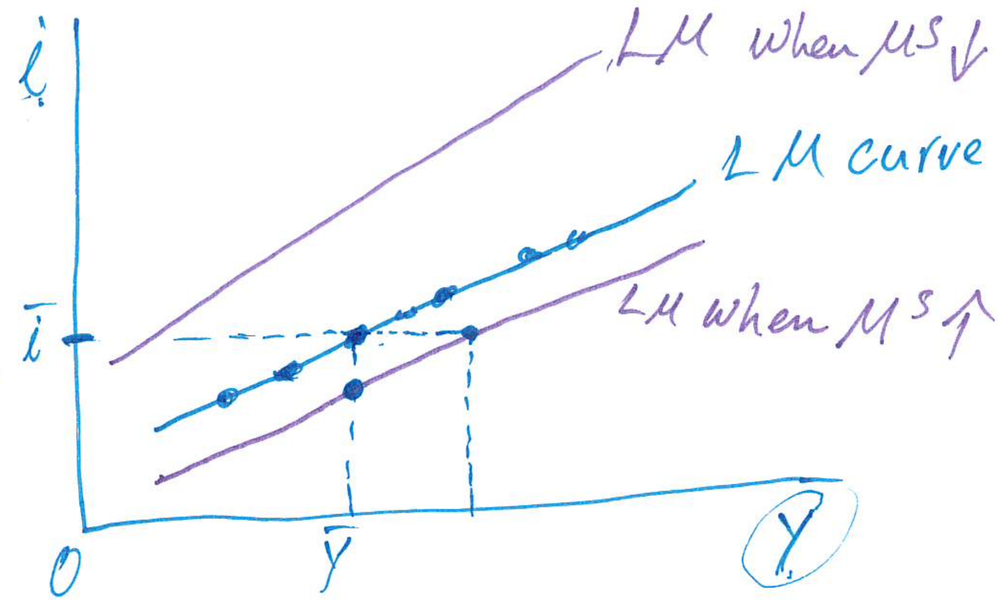
$\boxed{Y \text{ and } i^* \text{ are Positively related}}$ → LM Curve

M^S and i^* are negatively related. (given Y)
given P

LM curve:

→ Pairs (i, Y)

s.t. the M.M is in equilibrium.

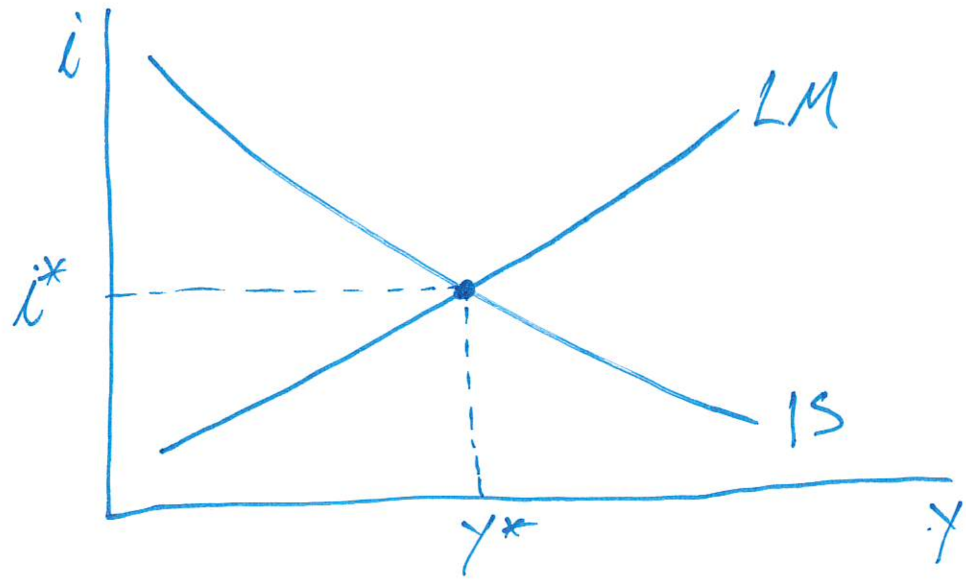


if $M^s \uparrow$

$$\uparrow M^s = \underline{\$Y} \cdot \uparrow L(i) \to i \downarrow$$

$$\uparrow M^s = \uparrow \$Y \cdot \underline{L(i)} \to Y \uparrow$$

Economy Equilibrium



For (i^*, Y^*) both markets are in eqm.

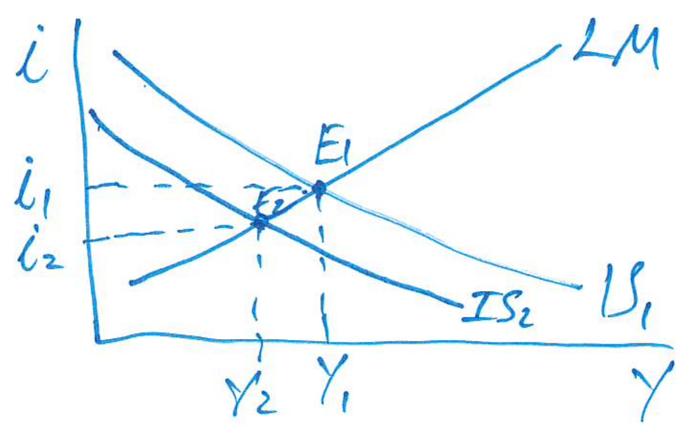
$$LM: \quad \frac{M^S}{P} = Y \cdot L(i)$$

$$IS: \quad Y = C(Y,T) + I(Y,i) + G$$

2 eq.
2 unk.
(i, Y).

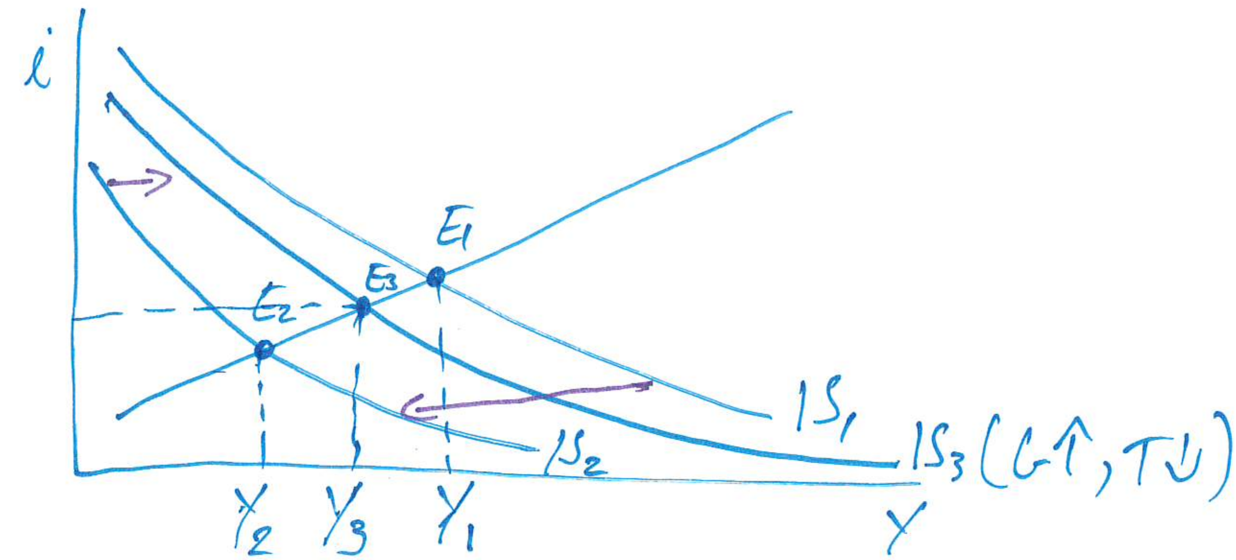
Application: Fiscal and Monetary Response in Recessions.

E.g. $MPC = c_1$ falls. $\rightarrow$ IS shifts to the left



IS_2: c_1 falls

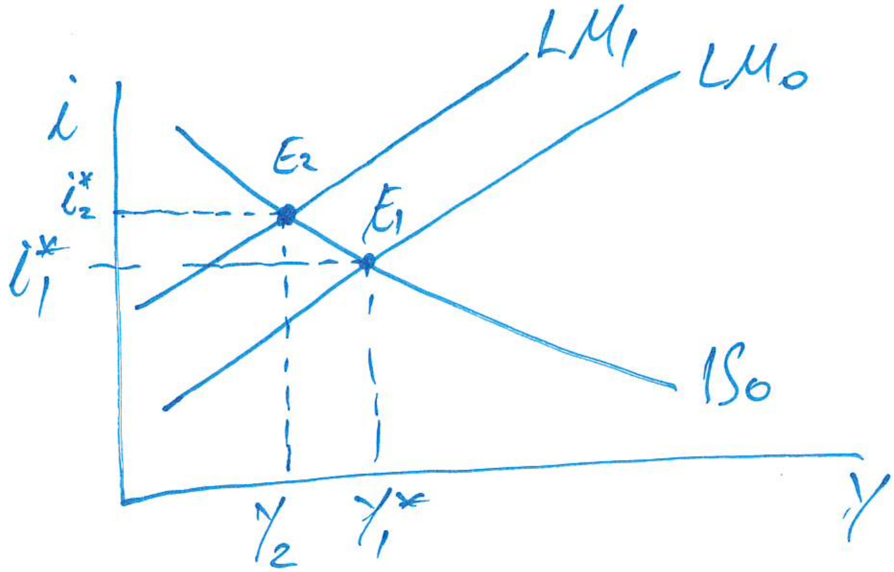
A) Fiscal response: $T\downarrow$ and/or $G\uparrow$



{ Homework: Response of C.B.
↳ Monetary Policy? }

Effects of Monetary Policy on Demand

- Ex. 1: CB <u>decreases</u> M^S.



$\boxed{Y^* \text{ falls and } i^* \text{ increases.}}$

See. <u>engineering a depression</u> by Robert Lucas.

Effects on Demand? $C(\underset{(+)}{Y}, \underset{(-)}{T})$: T: constant

$Y\downarrow \rightarrow C\downarrow$

$I(\underset{(+)}{Y}, \underset{(-)}{i})$: $\left.\begin{array}{l} Y^*\downarrow \rightarrow I\downarrow \\ i\uparrow \rightarrow I\downarrow \end{array}\right\} I\downarrow.$

H.W.: Effects of monetary expansion on C, I.
" " Fiscal " on C, I
" " Fiscal consolidation on C, I.