

# Macro Note 1

2024年7月11日 10:18

## Note 1

2021年11月18日 9:39

L<sub>1</sub>

$$1) \text{ GDP deflator}_t = \frac{\text{NGDP}_t}{\text{RGDP}_t} = \frac{P_{1t}Q_{1t} + P_{2t}Q_{2t} + P_{3t}Q_{3t}}{RGDP_t}$$

$$= \left( \frac{Q_1}{RGDP_t} \right) P_{1t} + \left( \frac{Q_{2t}}{RGDP_t} \right) P_{2t} + \left( \frac{Q_{3t}}{RGDP_t} \right) P_{3t}$$

$$2) \text{ CPI in month } t = \frac{E_t}{E_b} = \frac{P_{1t}C_1 + P_{2t}C_2 + P_{3t}C_3}{E_b}$$

$$= \left( \frac{C_1}{E_b} \right) P_{1t} + \left( \frac{C_2}{E_b} \right) P_{2t} + \left( \frac{C_3}{E_b} \right) P_{3t}$$

$\begin{cases} \text{Expansionary fiscal policy} \rightarrow \uparrow D_{\text{money}} \rightarrow \uparrow r \\ \text{Contractionary monetary policy} \rightarrow \downarrow S_{\text{money}} \rightarrow \uparrow r \end{cases}$

L<sub>2</sub>

$$1) \text{ Production Function } Y = F(K, L)$$

2) Return to scale

Constant  $Y_2 = z Y_1$

Increasing  $Y_2 > z Y_1$

Decreasing  $Y_2 < z Y_1$

$$3) \text{ MPL} = F(K, L+1) - F(K, L)$$

$$\text{MPL} = \frac{dF(K, L)}{dL}$$

$$\text{MPL} = \frac{W}{P}, \text{ MPK} = \frac{R}{P}$$

$$4) \text{ Total labor income} = \frac{W}{P} \bar{L} = \text{MPL} \times \bar{L}$$

$$\text{Total capital income} = \frac{R}{P} \bar{K} = \text{MPK} \times \bar{K}$$

$$\bar{Y} = \text{MPL} \times \bar{L} + \text{MPK} \times \bar{K} \quad (\text{Constant returns to scale})$$

$$5) \text{ } Y = AK^\alpha L^{1-\alpha}$$

$$\text{Capital income} = \text{MPK} \times K = \alpha Y$$

$$\text{Labour income} = \text{MPL} \times L = (1-\alpha)Y$$

$$6) \text{ Consumption Function } C = \underbrace{c(Y-T)}_{\text{Disposable Income}}$$

$$C(Y-T) = \bar{C} + c(Y-T) \quad c = MPC$$

预估的  $c$  收入中愿意支出的

7) Investment Function  $I = I(r)$   
 Real interest rate  
 $(\uparrow r \Rightarrow \downarrow I)$

$I = \bar{I} - br$   $b$  = responsiveness of investment to that  $r$   
 autonomous  $\bar{I}$   $\rightarrow$  Investment under the new  $r$

8) AD:  $C(\bar{Y} - \bar{T}) + I(r) + \bar{G}$   
 预估的收入  $\rightarrow$  预期政府支出

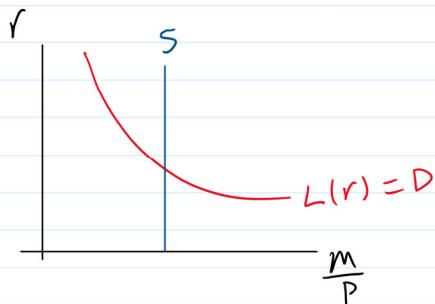
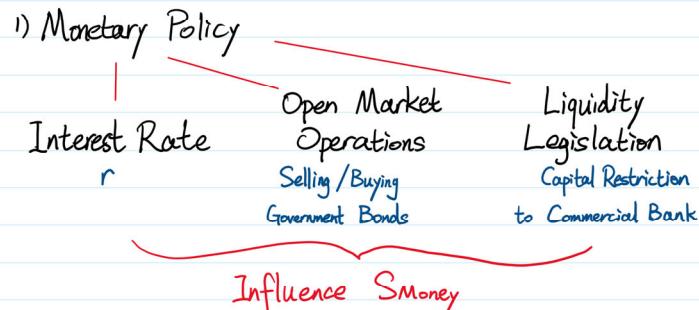
AS:  $\bar{Y} = F(\bar{K}, \bar{L})$   
 预计生产总值，基于现有的  $K, L$  水平

Equilibrium:  $\bar{Y} = C(\bar{Y} - \bar{T}) + I(r) + \bar{G}$   
 $AS = AD$

9) Monetary Policy  $\rightarrow$  change  $S_{Money}$

Fiscal Policy  $\rightarrow$  change  $G$

L3



2) Velocity of Money

$$V = \frac{P \times Y}{M}$$

Transaction ( $P \times Y$ )  
Money Supply

Quantity Equation:  $MV = PY$

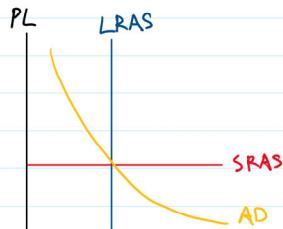
3)  $D_{Money}$   
 $\left(\frac{M}{P}\right)^d = kY$  Total Income  
 Purchasing Power  $\uparrow N$  of people wish to hold

$\uparrow k, \downarrow V$

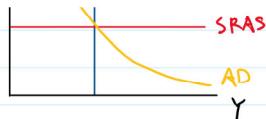
4) AD

$$Y = \frac{1}{K} \left( \frac{M}{P} \right)^d$$

5)  $Y > \bar{Y} \rightarrow \uparrow P$   
 $Y < \bar{Y} \rightarrow \downarrow P$   
 $Y = \bar{Y} \rightarrow -D$



5)  $Y > \bar{Y} \rightarrow \uparrow P$   
 $Y < \bar{Y} \rightarrow \downarrow P$   
 $Y = \bar{Y} \rightarrow = P$



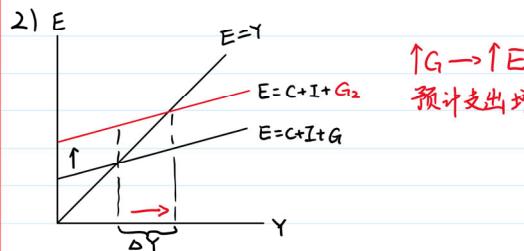
6) Return on Bond (B)

$$= \frac{\text{Face Value (B)} - \text{Current Price (B)}}{\text{Current Price (B)}}$$

L4

1) In closed economy (No international trad.)

$$E = C + I + G = \bar{C} + c(Y - \bar{T}) + \bar{I} + \bar{G} = (\bar{C} + \bar{I} + \bar{G} - c\bar{T}) + cY$$



3)

$$\Delta Y = \frac{1}{1-c} (\Delta \bar{C} + \Delta \bar{I} + \Delta \bar{G} - c \Delta \bar{T})$$

Multiplier ↓      = 0      (只有 G 增加)

$$\Delta Y = \frac{1}{1-c} \Delta \bar{G}$$

Multiplier: ↑ unit of G → ↑ unit of Y (Income)

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1-MPC}$$

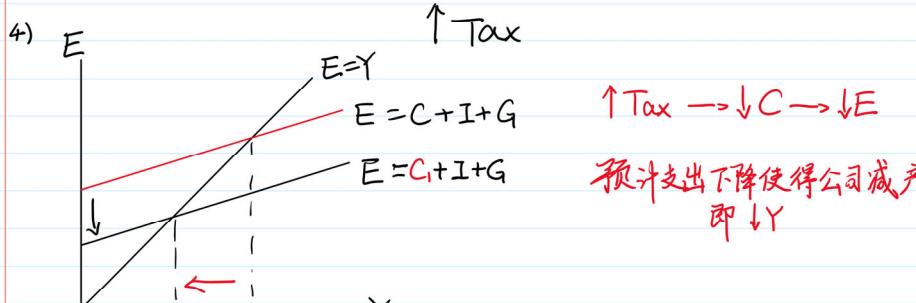
原因: ① ↑G → ↑Y (equal unit)

② ↑Y → ↑C

③ ↑C → ↑Y

.....

∴ ↑G 的影响大于其本身





Y ↑

$$5) \Delta Y = \frac{1}{1-c} (\Delta \bar{C} + \Delta \bar{I} + \Delta \bar{G} - c \Delta \bar{T})$$

(只有T)      指所缴纳的税  
                  等同于多少支出

$$\Delta Y = \frac{c}{1-c} \Delta \bar{T}$$

$$\text{Multiplier of Tax } \Delta Y = \frac{-c}{1-c} \Delta \bar{T}$$

$$T = tY \quad (t \text{ is tax rate})$$

$$c(Y-T) \rightarrow c(1-t)Y$$

$$\therefore Y = E = (\bar{C} + \bar{I} + \bar{G}) + c(1-t)Y$$

$$= \frac{1}{1-c(1-t)} (\bar{C} + \bar{I} + \bar{G})$$

$$\text{Multiplier of Tax } \uparrow = \frac{\Delta Y}{\Delta G} = \frac{1}{1-c(1-t)}$$

### 6) Investment

$$I = I(r) = \bar{I} - br \quad \text{实际的 } r$$

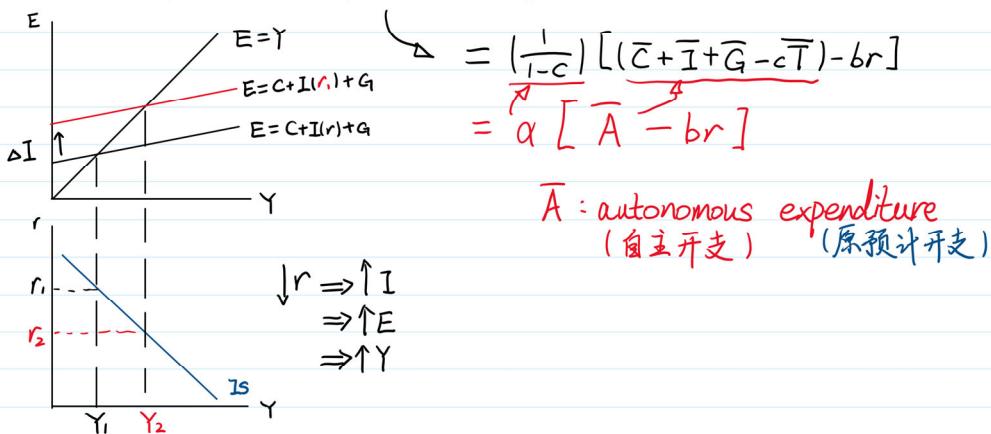
与r有关的I  $\uparrow$  预估I  $\downarrow$   $I$  与  $r$  的变化系数

(即描述当r变化时会带给I带来何变化)

原预估的I - 实际中因r变化导致的不同的I = 实际的I

### 7) IS curve ( $r$ 与 $Y$ )

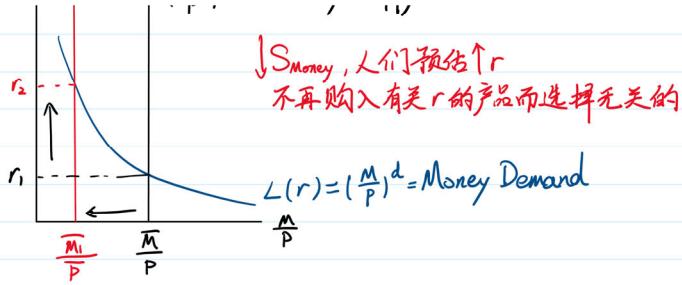
$$Y = C(Y - \bar{T}) + I(r) + \bar{G}$$



### 8)

$$r \quad \left( \frac{M}{P} \right)^S = \text{Money Supply}$$

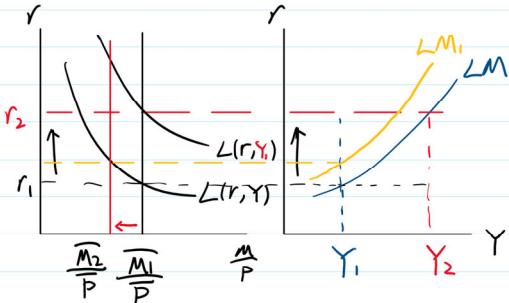
$\downarrow S_{\text{Money}}$ , 人们预估  $\uparrow r$



$LM (r \text{ 与 } Y)$

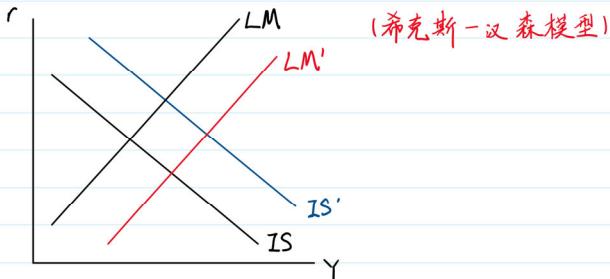
$$\frac{M}{P} = L(r, Y) = kY - hr$$

当 $r$ 变化时会对 $D$ 产生多少影响的系数  
当 $Y$ 变化时 $D$ 的变化  
当 $Y$ 变化时会对 $D$ 产生多少影响的系数



L5

- 1) Fiscal Policy : change  $\Delta G$  &  $\Delta T$  (IS Move)  
Monetary Policy : change  $\Delta M$  (LM Move)



- 2) Central Bank can responses in 3 dimensions

1.  $M$
2.  $r$
3.  $Y$

3) IS

$$Y = \alpha [\bar{A} - br] \quad (\frac{1}{1-c}) [(\bar{C} + \bar{I} + \bar{G} - c\bar{T}) - br]$$

$$\frac{dr}{dY} = -\frac{1}{ab} \quad ; \quad (Y=0) \quad r = \frac{\bar{A}}{b} \quad (b \text{ 决定 IS 倾斜程度 (越小越陡)})$$

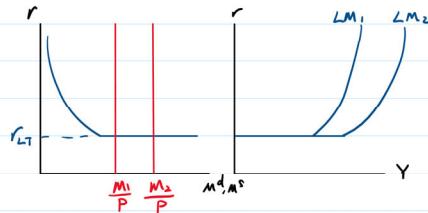
LM

$$\frac{M}{P} = kY - hr \quad r = \frac{1}{h} (kY - \frac{M}{P})$$

$$\frac{dr}{dY} = \frac{k}{h} > 0 \quad ; \quad (Y=0) \quad r = -\frac{1}{h} \frac{M}{P} \quad (h \text{ 决定 LM 倾斜程度 (越大越平)})$$

## 4) Liquidity Trap

$r$  reach a *certain low level*, opportunity cost of holding 'cash' falls to zero & interest-bearing assets become unattractive.  
 (当持有 cash 的机会成本小于 value of liquidity)



## 5) IS shocks

exogenous changes in the demand for goods & services

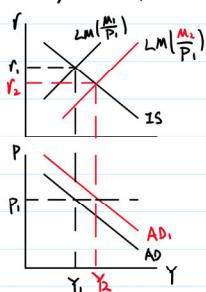
LM shock

exogenous changes in the demand for money

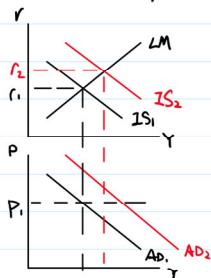
## 6) IS-LM & AD

(analyze short run)

### Monetary Policy



### Fiscal Policy



## SR & LR

In the short-run equilibrium, if	then over time, the price level will
$Y > \bar{Y}$	rise
$Y < \bar{Y}$	fall
$Y = \bar{Y}$	remain constant

L6

## 1) Mundell Fleming Model

$$r = r^*$$

(perfect K mobility/no K restrictions T(r))

$\therefore IS^*$

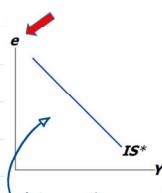
$$Y = C(Y - \bar{T}) + I(r^*) + G + NX(e) \\ = \text{nominal exchange rate}$$

= foreign currency / domestic currency

$$Y = [\bar{C} + c(Y - \bar{T})] + [\bar{I} - br^*] + [\bar{G}] + [NX - nxe]$$

支出比例 x (税后收入)

$$= (\bar{C} + \bar{I} + \bar{G} + \bar{NX} - c\bar{T}) - br^* - nxe + cY$$



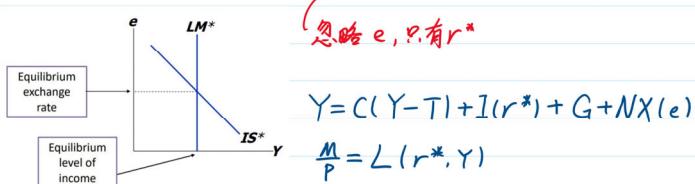
当  $e \Rightarrow \uparrow NX \Rightarrow \uparrow Y$  (汇率更改)

支出出口受汇率影响系数 × exchange rate

$$\begin{aligned}
 & \text{支出比例} \times (\text{税后收入}) \\
 & = (\bar{C} + \bar{I} + \bar{G} + \bar{N}X - c\bar{T}) - br^* - nxe + cY \\
 & = \left(\frac{1}{1-c}\right)[(\bar{C} + \bar{I} + \bar{G} + \bar{N}X - c\bar{T}) - br^* - nxe] \\
 & = \alpha[\bar{A} - br^* - nxe] \\
 \text{or } e &= \frac{\bar{A} - br^*}{nx} - \frac{Y}{\alpha nx}
 \end{aligned}$$

$LM^*$ :

$$\frac{M}{P} = L(r^*, Y) \Rightarrow \frac{\bar{M}}{P} = kY - hr^* \Rightarrow Y = \frac{1}{k} \left( \frac{\bar{M}}{P} + hr^* \right)$$



$$Y = C(Y-T) + I(r^*) + G + NX(e)$$

$$\frac{M}{P} = L(r^*, Y)$$

- 是 floating exchange rate system

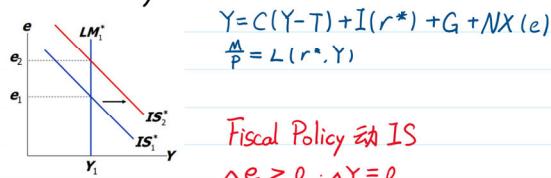
( $e$  可随经济条件变化浮动)

- Fixed exchange rate system

(央行控制外汇)

## 2) Policy under the floating exchange rates

Fiscal Policy

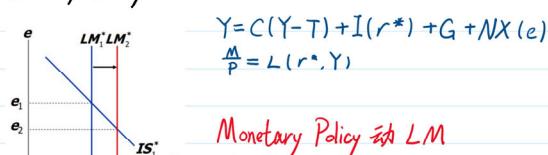


(Fiscal Policy cannot affect real GDP)

Closed economy: Fiscal Policy  $\uparrow r$ , crowds out 'I'.

Small Opened economy: Fiscal Policy  $\uparrow e$  (appreciate) crowds out 'NX'.

Monetary Policy

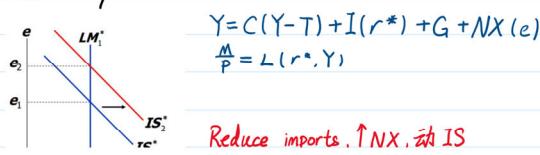


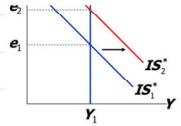
(Monetary Policy affect components of AD to affect  $Y$ )

Closed economy:  $\uparrow M \Rightarrow \downarrow r \Rightarrow \uparrow I \Rightarrow \uparrow Y$

Small open economy:  $\uparrow M \Rightarrow \downarrow e \Rightarrow \uparrow NX \Rightarrow \uparrow Y$

Trade Policy





$e \leftarrow \dots \rightarrow e_1$

Reduce imports,  $\uparrow NX$ ,  $\uparrow Y$   
 $\Delta e > 0 ; \Delta Y > 0$

(Trade restriction reduces imports)

$\uparrow e$  reduce export)

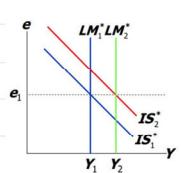
Restriction can't reduce trade deficit!

Restriction: save job in domestic industry  
 destroy jobs in export producing country

### 3) Policy under the fixed exchange rates

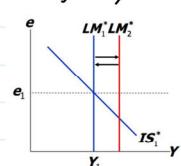
(央行行动  $LM^*$  维持  $e$ )

Fiscal Policy



Floating 下 ineffective 对于改变  $Y$   
 Fixed 下 very effective 对于改变  $Y$   
 $\Delta e = 0 ; \Delta Y > 0$   
 $\Rightarrow IS^*, 央行行为控制 LM^*$

Monetary Policy



Floating 下 very effective 去改变  $Y$   
 Fixed 下 无用 改变  $Y$   
 $\Delta e = 0 ; \Delta Y = 0$

### 4) $r \neq r^*$

Country Risk 不同: the risk that government will default on their  
 loan repayment  
 $\Rightarrow$  收取更高 interest rate)

### 5) Differentials in the M-F model

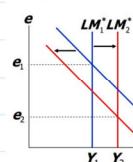
$$r = r^* + \theta$$

(risk premium)

$$Y = C(Y - T) + I(r^* + \theta) + G + NX(e)$$

$$\frac{M}{P} = L(r^* + \theta, Y)$$

$\uparrow \theta$



$\uparrow \theta \Rightarrow \uparrow r \Rightarrow \downarrow I \therefore IS^* \text{ shifts left}$

$\uparrow \theta \Rightarrow \uparrow r \Rightarrow \downarrow (\frac{M}{P})^d \therefore LM^* \text{ shifts right}$

$\therefore \uparrow Y$

$\Delta e < 0 ; \Delta Y > 0$

$\downarrow e : \uparrow \text{Country risk} ; \text{expected } \downarrow e \text{ make } \downarrow \text{Demand of Currency}$

$\uparrow Y : NX \text{ boosting is greater than } \downarrow I$

### 6) IS/LM/BP Model

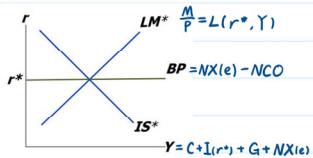
Interest Rate Taking: being a small open economy the 'r' is decided  
 elsewhere in the world  $r = r^*$

· Interest Rate Taking: being a small open economy the 'r' is decided elsewhere in the world  $r = r^*$

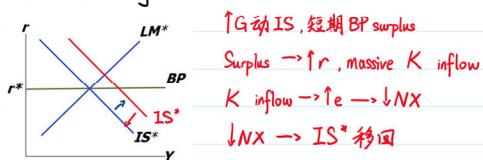
· Perfect Capital Mobility: 'K' 移动不受限, 分配速率提高

· Balance of Payments (BP): trade balance is balanced with net 'K' outflow. 'K' must flow to facilitate trade

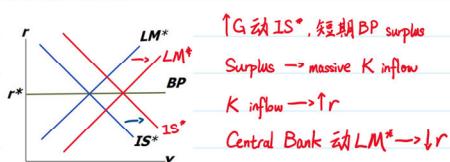
Equilibrium



Fiscal in Floating



Fiscal in Fixed



## 7) Floating VS Fixed

Floating

- Allow monetary policy to be used to pursue other goals (low inflation ...)
- Avoids uncertainty & volatility, making international transaction easier.
- Disciplines monetary policy to prevent excessive money growth & hyperinflation.

Fixed

- Allows central bank to control interest rate  $r$ .
- Provides stability for international transactions.
- Facilitates capital mobility.