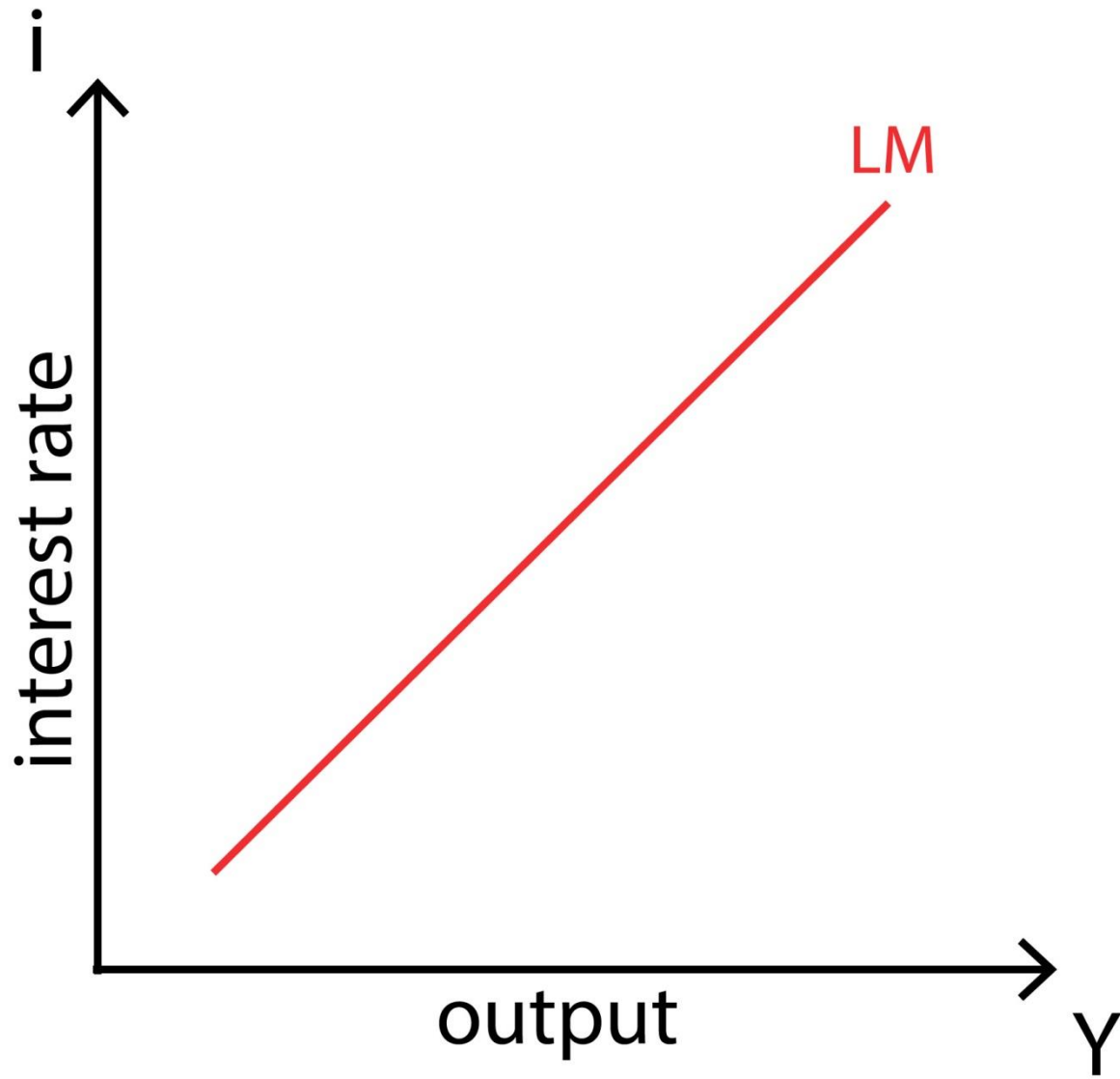


# IS-LM Model

## Part 2

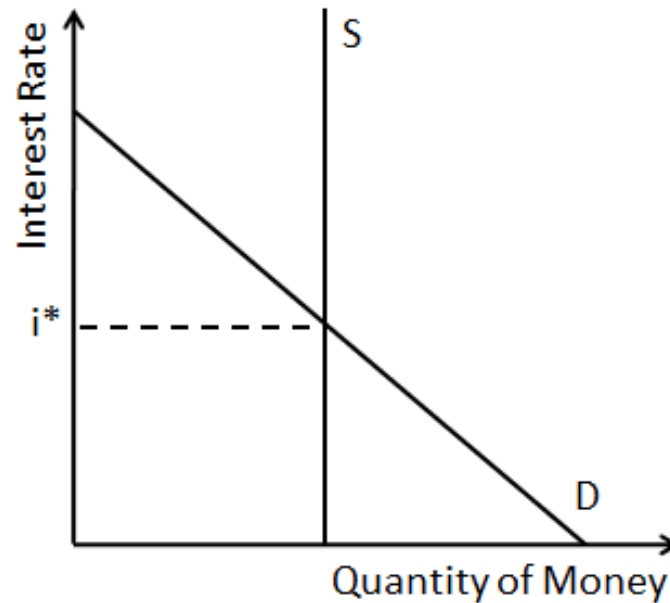
# The LM Curve

- The LM curve shows a **positive** relationship between  $i$  and  $Y$  in the money market.
- Like the IS curve, the LM curve is a LOCUS of “points”.
- Here, each point/coordinate,  $(i, Y)$ , constitutes an equilibrium in the money market.
  
- The intuition behind the positive relationship of  $i$  and  $Y$  is as follows:
- At higher level of  $Y$  (people have more income), people have more demand for money to buy goods and services. Higher demand for money drives up interest rate.



# Deriving the LM Curve

- To derive the LM curve, we start with the equilibrium condition in the money market:
- **REAL** money demand ( $M_d$ ) = **REAL** money supply ( $M_s$ ).
- We shall look at  $M_d$  and  $M_s$  separately.



# Deriving the LM Curve

- Recall that  $M_s$  is determined by the central bank and is constant (hence, it is a vertical line).
- $M_s$  is given by  $M/P$  (real amount of money),
  - where  $M$  = nominal amount, and  $P$  = price level.
- Note that  $P$  here is assumed to be constant due to sticky price. In the next AD/AS model,  $P$  can vary.
- $M_d$  is determined by the liquidity preference theory.

# Deriving the LM Curve

- Recall that people demand money for 3 reasons:
  - Transaction demand:  $Y \uparrow \gg Md \uparrow$
  - Precautionary demand:  $Y \uparrow \gg Md \uparrow$
  - Speculative demand:  $i \uparrow \gg Md \downarrow$
- Therefore, we can write  $Md = L(Y, i)$
- To illustrate,  $L$  can take the form  $L(Y, i) = L_Y \cdot Y - L_i \cdot i$ .

- **The equilibrium of the money market is**

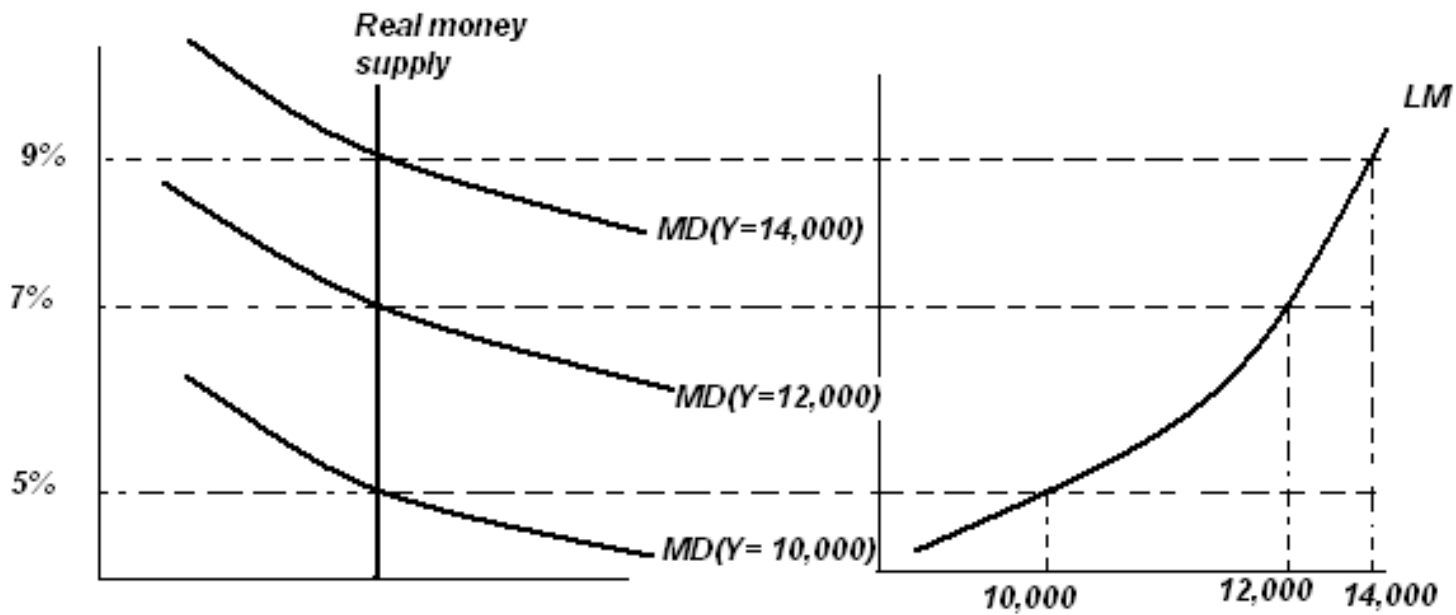
$$M_s = M_d$$

$$M/P = L(Y, i)$$

# Deriving the LM Curve

- Now, we can use the equilibrium condition of the money market  $M/P = L(Y, i)$  to draw the LM curve.
- Note that  $M/P$  is constant. Therefore, **when  $i$  changes,  $Y$  has to change too** in order for the equality to hold.
- So, whenever  $i$  goes up,  $Y$  has to go up as well, because
  - When  $i \uparrow \gg Md \downarrow$       AND      When  $Y \uparrow \gg Md \uparrow$
- Here, **the TWO changes in  $Md$  cancel out each other**, so that  $Md$  remains the same and equal to  $M_s$ .
- The LM curve is drawn from this positive relationship between  $i$  and  $Y$ .

# Deriving the LM Curve

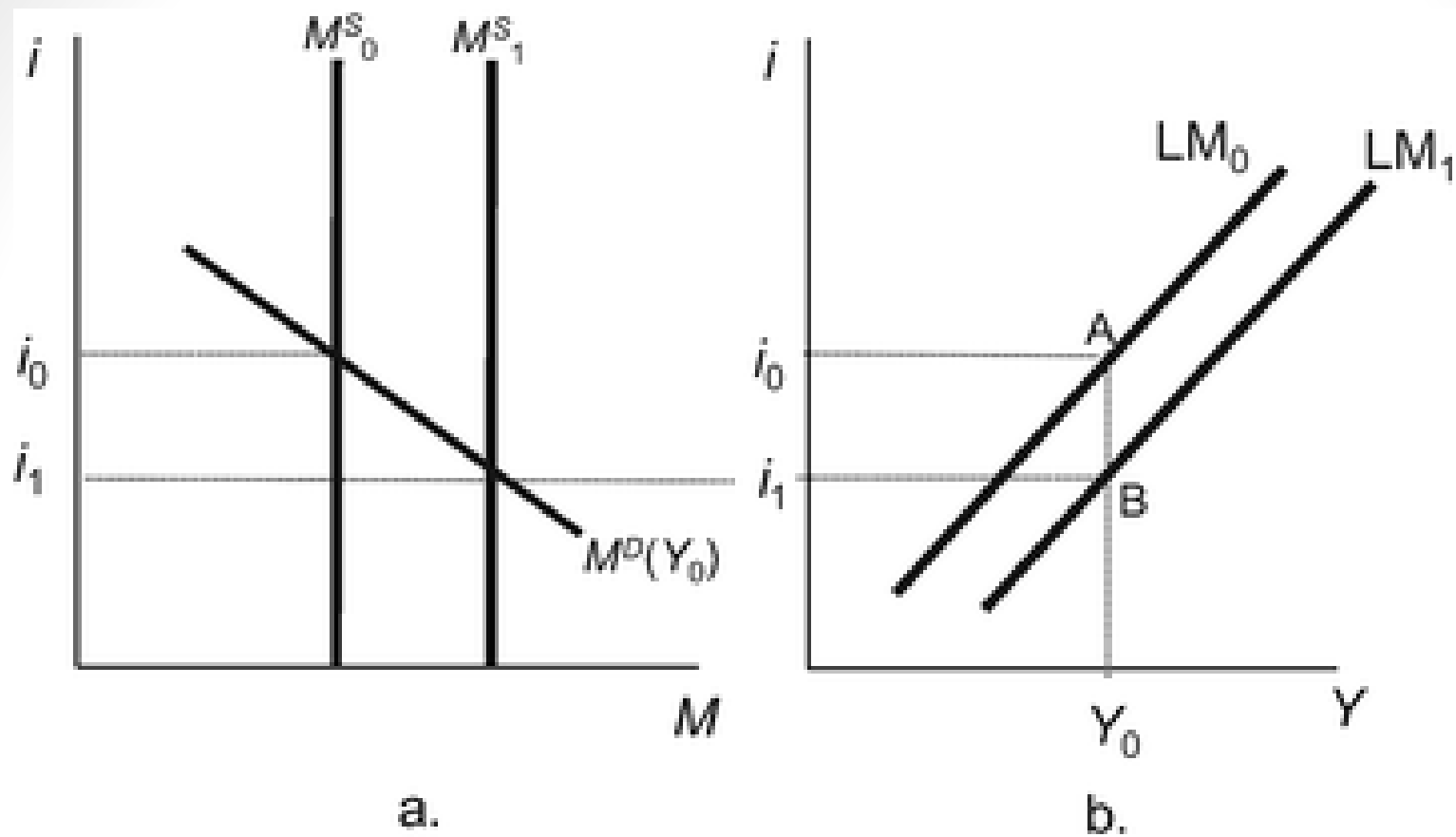


# Movement along the LM curve

- LM equation:  $M/P = L(i, Y)$
- Movement along the curve is due to the change in  $i$ , **while keeping M and P constant.**
- **LOGIC** Higher interest rate reduces the demand for money. To maintain the demand for money equal to the fixed money supply, the level of income has to rise so that the demand for money will rise too.
- $i \uparrow \gg Md \downarrow \gg Y \uparrow \gg Md \uparrow \gg Md = Ms$
- Hence, we have positive relationship between  $i$  and  $Y$ .
- However, when  $M$  or  $P$  changes, we have shift in LM curve.

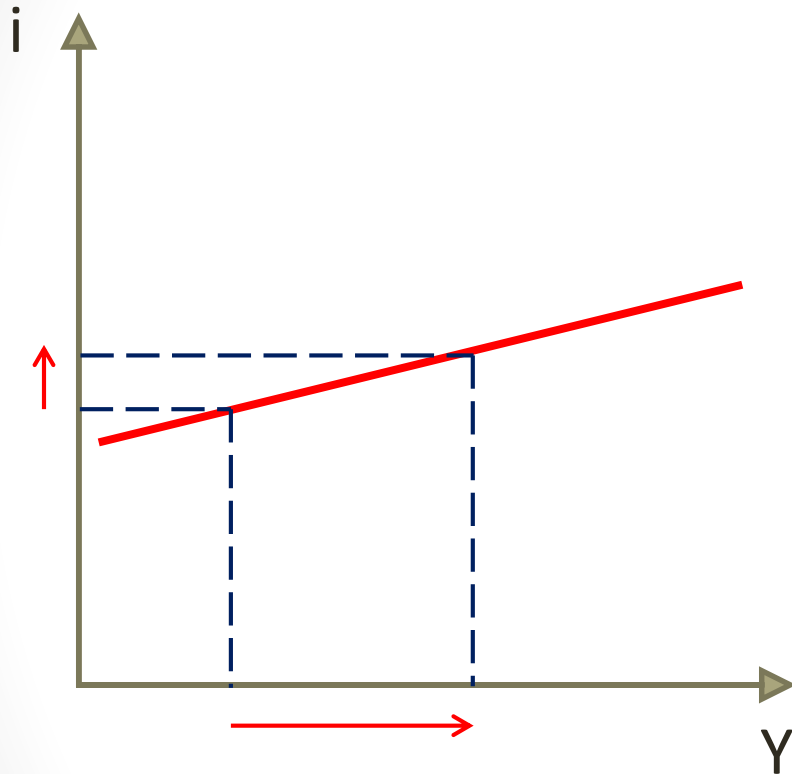
# Shift in the LM curve

- **Shift in the money demand curve** causes **movement** along the LM curve.
- **Shift in the money supply curve** causes **shift** in the LM curve.
- **When real money supply increases** (due to  $M \uparrow$  OR  $P \downarrow$ ), the interest rate has to fall to induce higher real money demand (since we need  $M_d = M_s$ ). Hence, at a given level of output, the interest rate is now lower.
- That is, **the LM curve shifts down/ to the right.**

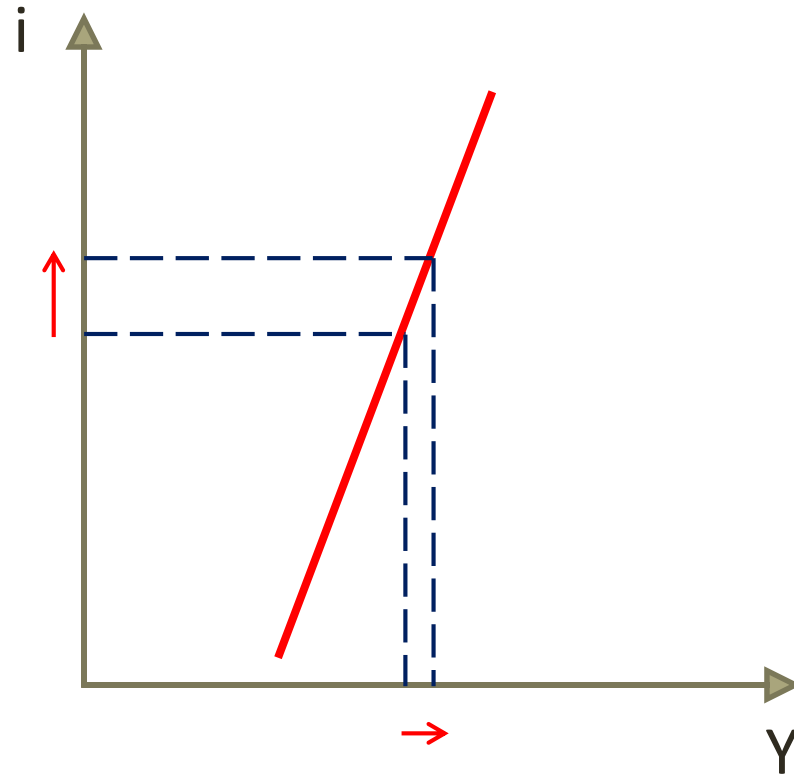


An increase in the money stock shifts the LM curve to the right. At each level of income, the equilibrium interest rate has to be lower to induce people to hold the larger quantity of money.

# Slope of the LM curve



An increases in  $i$  causes  
a large increase in  $Y$   
>> FLAT LM curve



An increases in  $i$  causes  
a small increase in  $Y$   
>> STEEP LM curve

# Slope of the LM curve

LM Curve:  $M/P = L(i, Y)$  with  $\frac{dL}{di} < 0$  and  $\frac{dL}{dY} > 0$

- We can write  $L(i, Y) = L_Y \cdot Y - L_i \cdot i$  where  $L_Y, L_i > 0$
- $L_Y$  denotes the sensitivity of Md to changes in  $Y$
- $L_i$  denotes the sensitivity of Md to changes in  $i$ .
- The slope of the LM curve thus depends on  $L_Y$  and  $L_i$ .

# Slope of the LM curve

- LM Curve:  $M/P = L(i, Y) = L_Y \cdot Y - L_i \cdot i$
- Rearrange:  
$$M/P = L_Y \cdot Y - L_i \cdot i$$
$$L_i \cdot i = L_Y \cdot Y - M/P$$
$$i = (L_Y/L_i)Y - (1/L_i)(M/P)$$
- $(L_Y/L_i) =$  Slope of the LM Curve
- Thus, the LM is steep when  $L_Y$  is large or  $L_i$  is small.

# Slope of the LM curve

- $i = (L_Y/L_i)Y - (1/L_i)(M/P)$
- The LM is steep when  $L_Y$  is large or  $L_i$  is small.
- $L_Y$  tells us about how much  $M_d$  changes when  $Y$  changes.
- When  $L_Y$  is large ( $M_d$  sensitive to  $Y$ ),

$Y \uparrow$  a little  $\gg M_d \uparrow$  a lot (Now,  $M_d > M_s$ )

BUT we need  $M_d = M_s$ ,  $i$  will have to adjust.

$i \uparrow$  a lot  $\gg M_d \downarrow$  a lot  $\gg M_d$  cancel each other

Then, we have  $M_d = M_s$ , i.e. the equilibrium is restored.

- When  $i \uparrow$  a lot and  $Y \uparrow$  a little, the LM curve is **STEEP**.

# Slope of the LM curve

- $i = (L_Y/L_i)Y - (1/L_i)(M/P)$
- The LM is steep when  $L_Y$  is large or  $L_i$  is small.
- $L_i$  tells us about how much  $M_d$  changes when  $i$  changes.
- When  $L_i$  is small ( $M_d$  not sensitive to  $i$ ),  
 $i \uparrow$  a lot  $\gg M_d \downarrow$  a little (Now,  $M_d < M_s$ )  
BUT we need  $M_d = M_s$ ,  $Y$  will have to adjust.  
 $Y \uparrow$  a little  $\gg M_d \uparrow$  little  $\gg M_d$  cancel each other  
Then, we have  $M_d = M_s$ , i.e. the equilibrium is restored.
- When  $i \uparrow$  a lot and  $Y \uparrow$  a little, the LM curve is **STEEP**.