ECO 209Y
Macroeconomic Theory and Policy

Lecture 11:
The IS-LM Model and Exogenous/Endogenous Money

KEYNESIAN MONETARY THEORY

EXOGENOUS MONEY SUPPLY

KEYNESIAN MONETARY THEORY

- Keynes treated real ***money supply*** (M^S) as an ***exogenous*** variable determined by the central bank

$$M^S = M/P$$

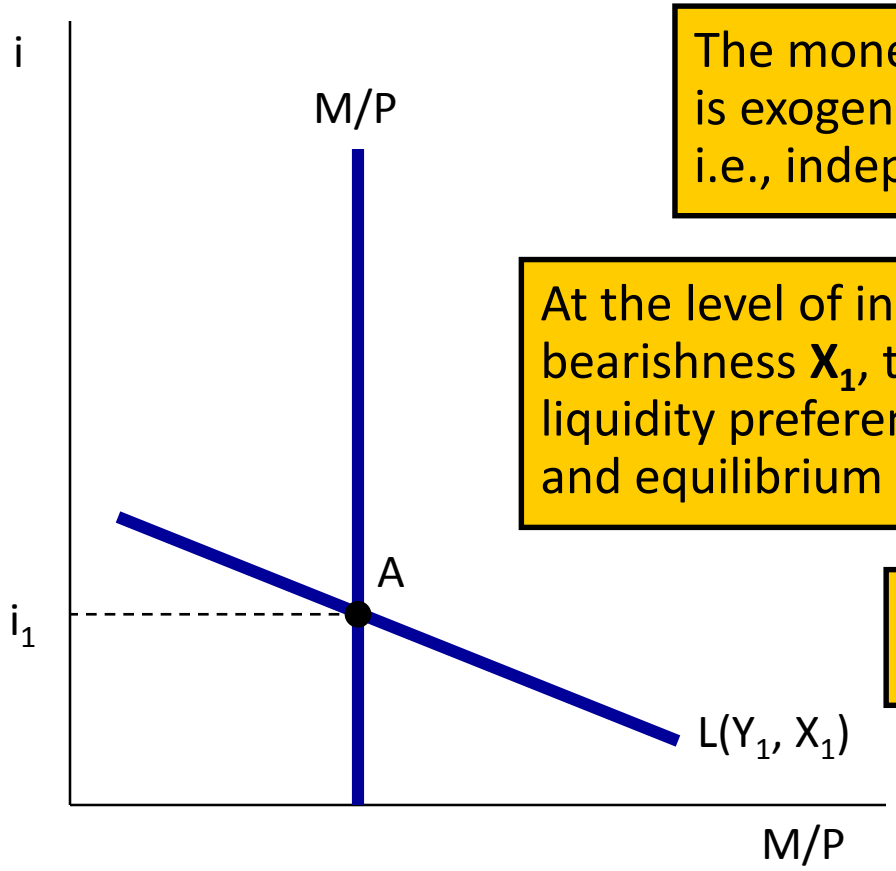
- For him, real ***money demand*** was determined by the nominal ***interest rate*** (***yield***) on bonds (**i**), the level of real ***income*** (**Y**), and the ***state of bearishness*** (**X**)

$$M^D = M\ (i, Y, X)$$

- For a given **Y** and **X**, **i** changes to equate the real money ***supply*** and the real money ***demand*** (or ***liquidity preference***)

$$M\ (i, Y_1, X_1) = L\ (Y_1, X_1) \qquad M/P = L\ (Y_1, X_1)$$

KEYNESIAN MONEY MARKET EQUILIBRIUM

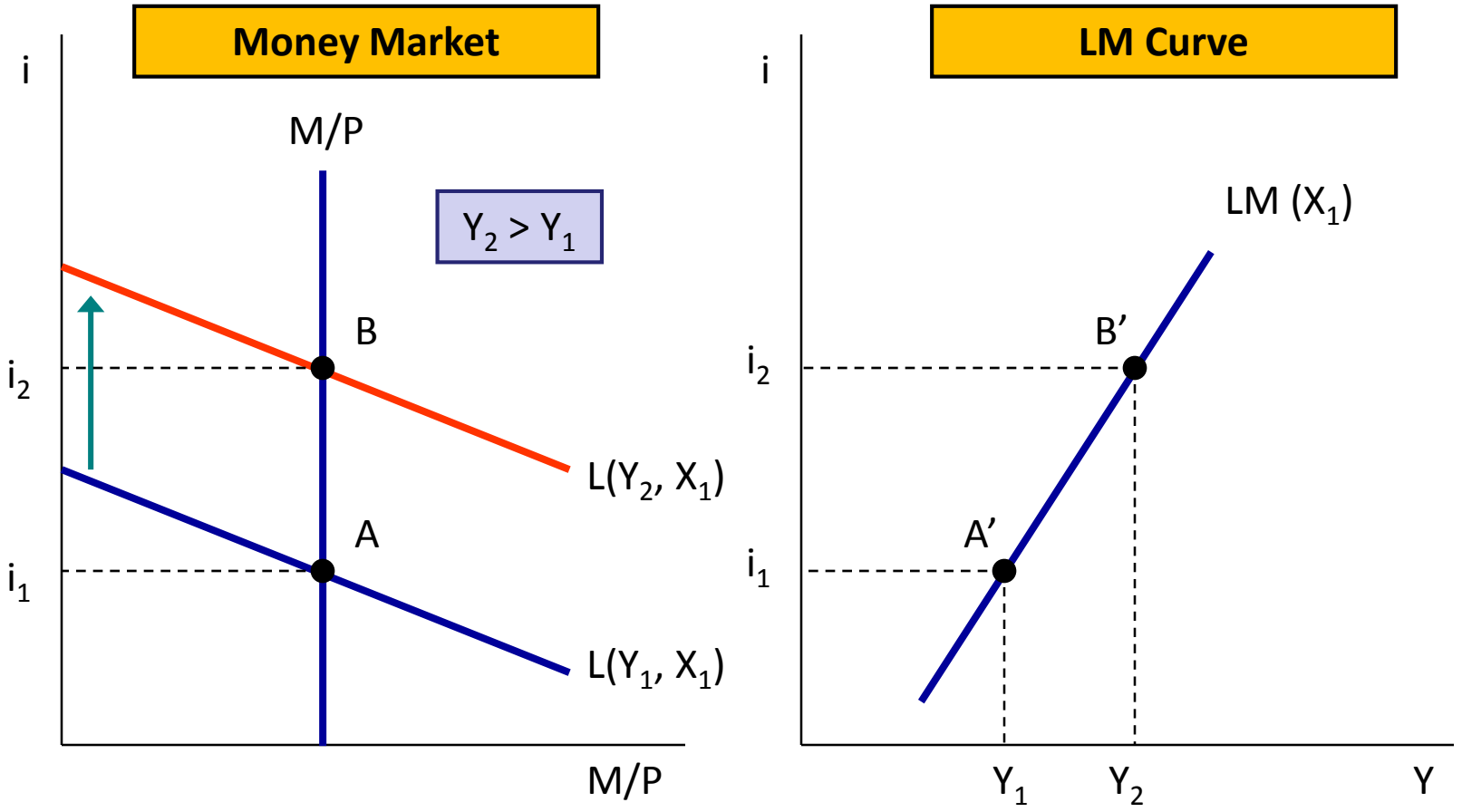


The money supply $\mathbf{M^S = M/P}$ is exogenously determined, i.e., independent of **i**, **Y** and **X**.

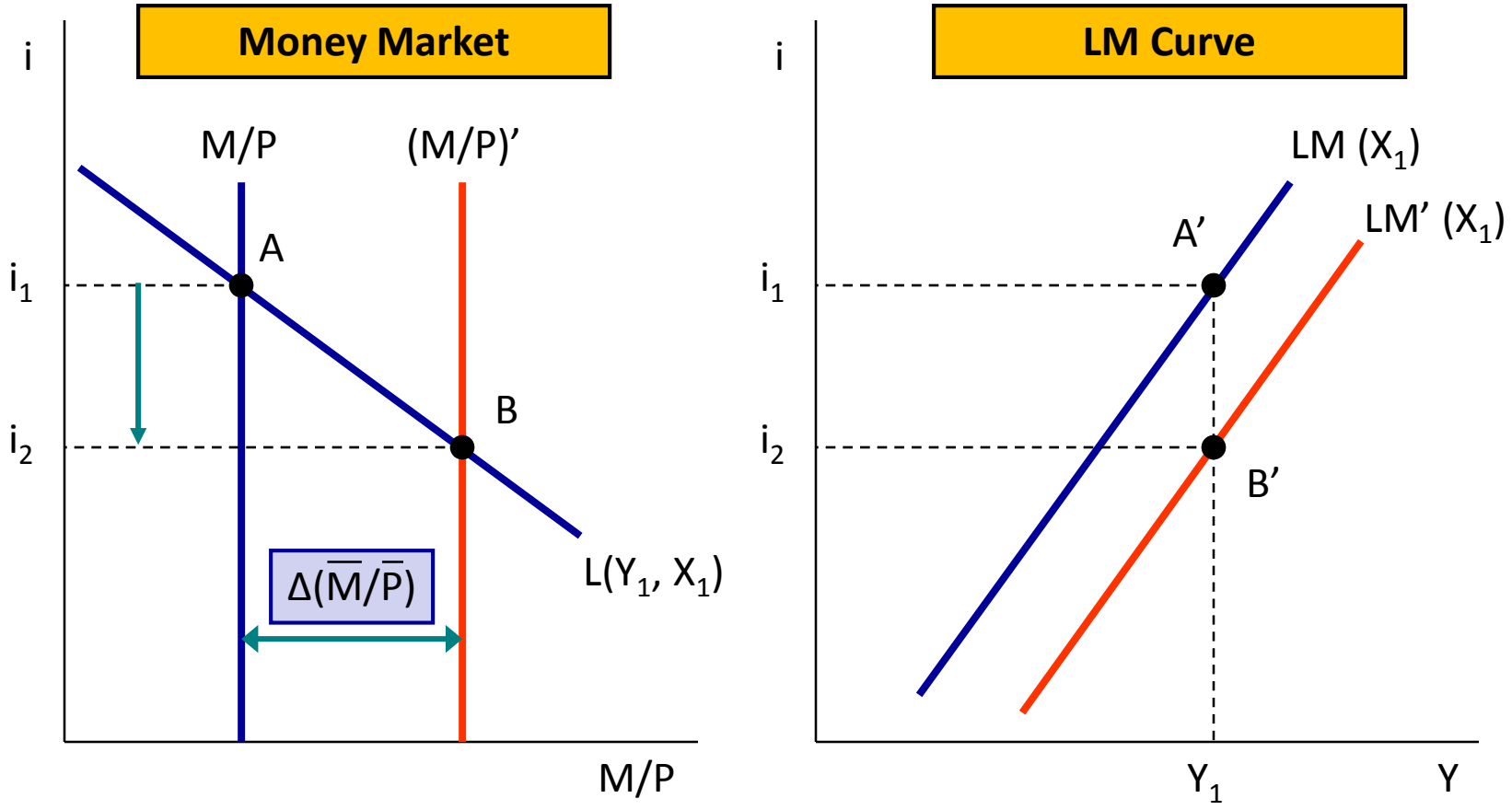
At the level of income $\mathbf{Y_1}$ and state of bearishness $\mathbf{X_1}$, the corresponding liquidity preference curve is $\mathbf{L(Y_1, X_1)}$ and equilibrium interest rate is $\mathbf{i_1}$.

$$\mathbf{M^D = L\,(Y_1, X_1)}$$

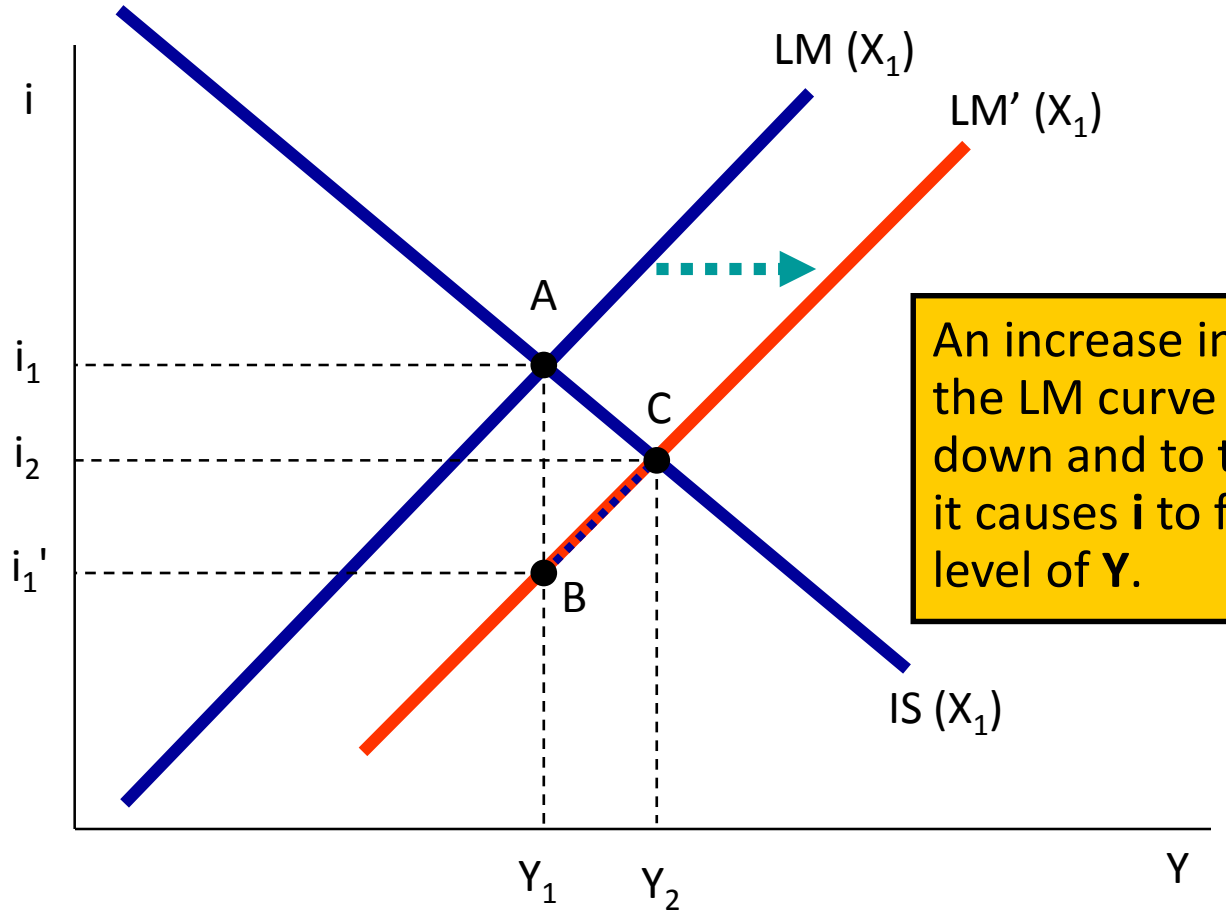
Keynesian Money Market Equilibrium and the LM Curve



An Increase in Exogenous Money Supply and the LM Curve



Impact of an Increase in Exogenous Money Supply



An increase in $\mathbf{M^S}$ causes the LM curve to shift down and to the right, i.e., it causes **i** to fall at each level of **Y**.

Neo-Keynesian Monetary Theory

Endogenous Money Supply

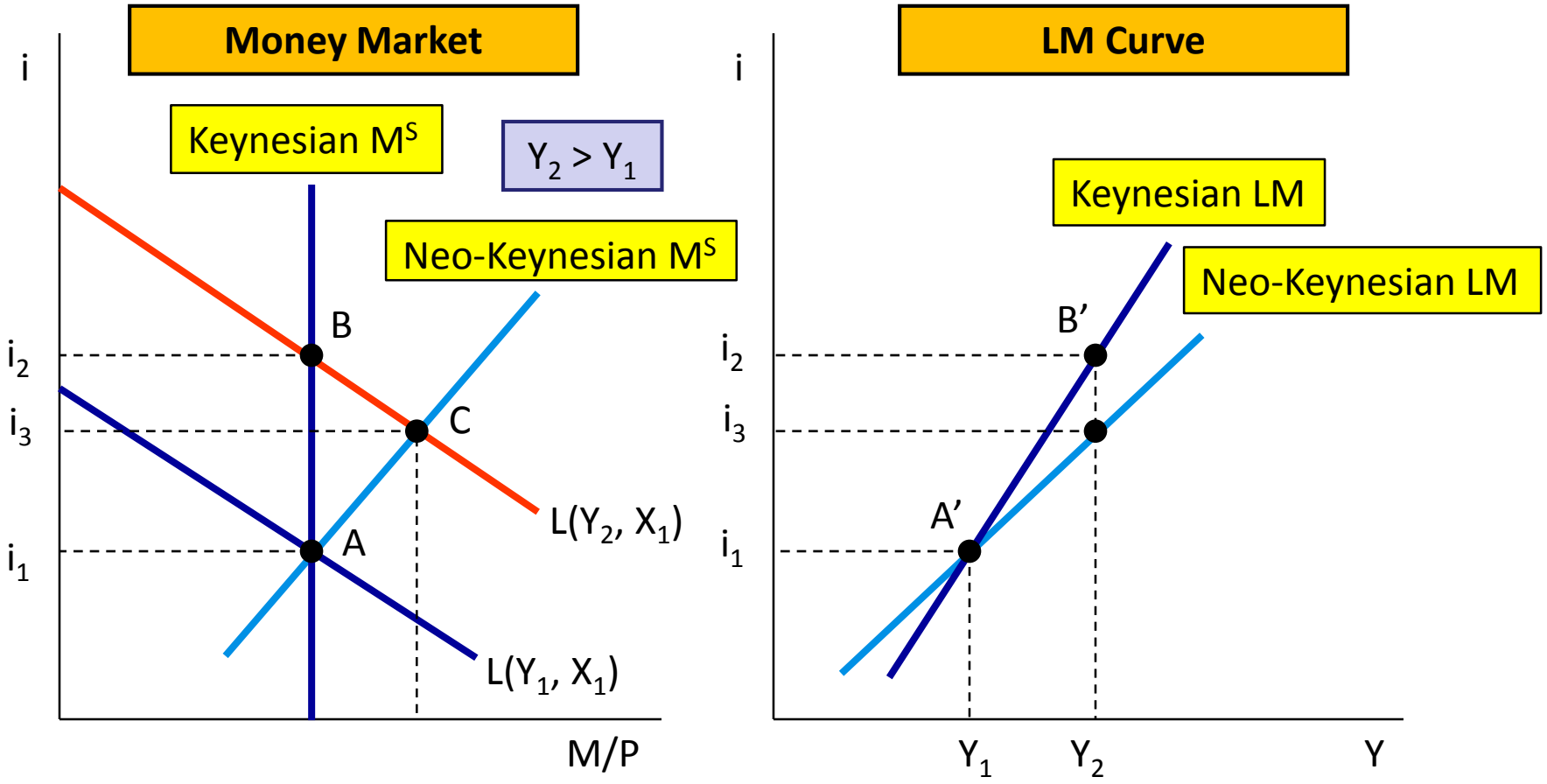
Neo-Keynesian Model with Money Supply Rule

- The ***Bank of Canada*** controls the stock of ***high-powered money*** or ***monetary base*** (**B**) but ***not*** the ***money supply***
- The ***money supply*** (M^S) is determined by the ***monetary base*** (**B**) and the ***money multiplier*** (**mm**)

$$M^S = mm\ B$$

- **B** is considered ***exogenous*** but **mm** is ***endogenous***
  - **mm** depends on the desired ***cash-reserve*** ratio (**re**) and the desired ***currency-deposit*** ratio (**cu**)
  - For a given **B**, as the **rate of interest** rises (**i**), banks provide more risky loans and **re** falls and **mm** increases
- Therefore, the real ***supply of money*** (M^S) increases with the ***interest rate*** (**i**), i.e., **B** is ***exogenous*** but M^S is ***endogenous***

Neo-Keynesian Money Supply Rule and the LM Curve



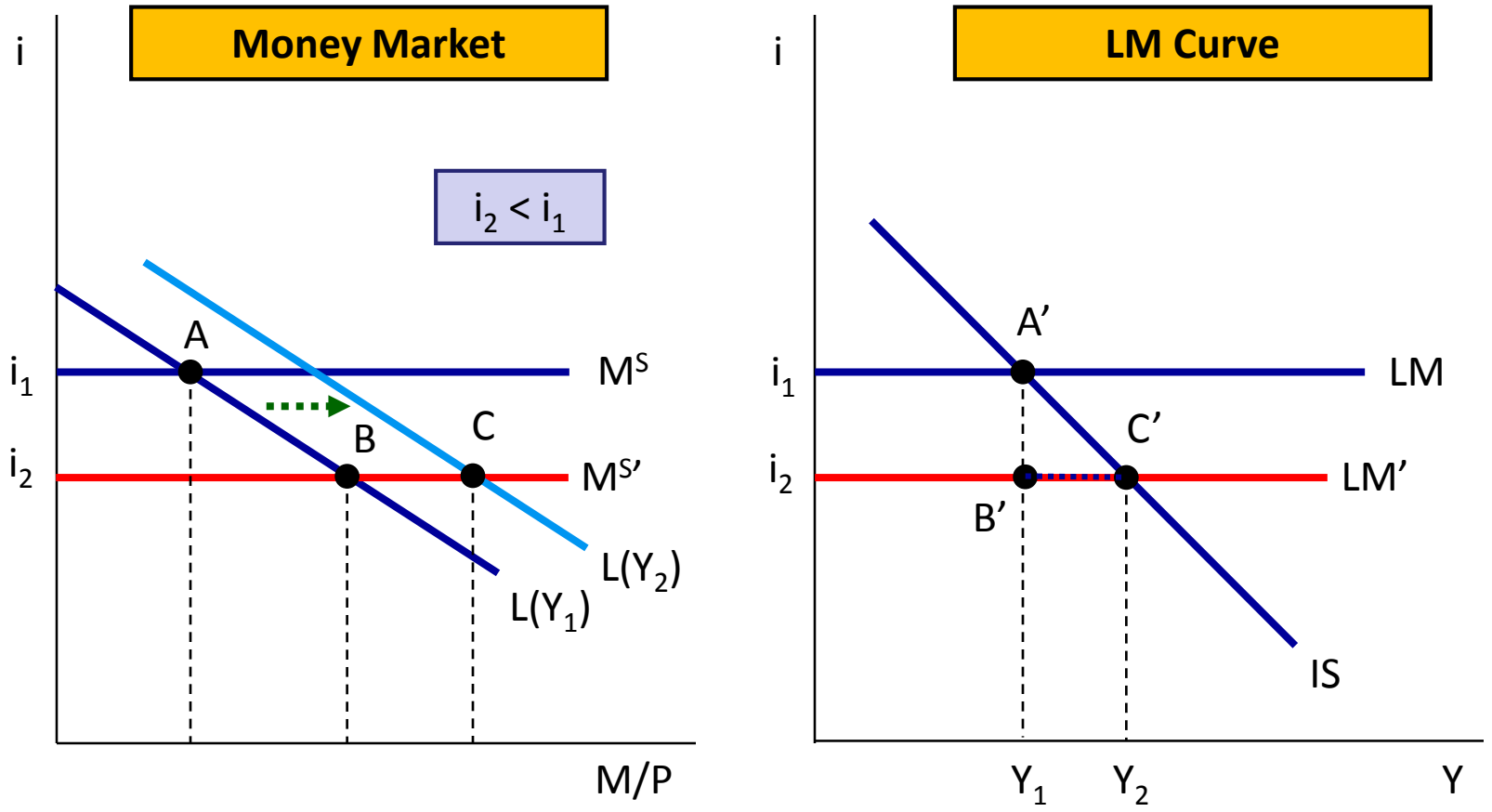
Neo-Keynesian Model with Interest Rate Rule

- In this case the ***Bank of Canada*** targets the ***rate of interest*** (not the ***money supply***)
- The ***money supply*** (M^S) is thus horizontal at the target ***interest rate*** (i_1)

$$i = i_1$$

- The real ***money stock*** is thus determined by the real ***money demand***
- The Bank of Canada must change the ***monetary base*** as needed to keep the ***rate of interest*** at its target
  - Thus the ***monetary base*** becomes ***endogenous***

Neo-Keynesian Interest Rate Rule and the LM Curve



Post-Keynesian Monetary Theory

Endogenous Money Supply

POST-KEYNESIAN THEORY OF ENDOGENOUS MONEY

- This theory is in opposition to traditional Keynesian theory but, most particularly, to ***monetarism***, for which ***money*** supply is also ***exogenous***
- We'll examine two different Post-Keynesian ***approaches*** to money supply determination: ***horizontalism*** and ***structuralism***
- Both approaches subscribe to the core proposition that ***bank lending*** drives ***money***
- We will focus on simple versions of the ***horizontalist*** and ***structuralist*** models of ***endogenous*** money supply

Main Features of Post-Keynesian Endogenous Money Models

- ***Loans*** create ***deposits***
  - That is, ***money*** creation is not the result of an increase in banks' ***reserves***
- The ***money multiplier*** is an after-the-fact phenomenon
  - It is ***not*** a driver of ***money supply*** creation
- The determination of the ***money supply*** (M^S) reflects a ***loan multiplier***
  - There is no ***money supply*** schedule per se (relating **M** and **i**)
  - ***Money*** is created by bank ***lending***

POST-KEYNESIAN MONETARY THEORY

HORIZONTALIST MODEL

Assumptions of the Post-Keynesian Horizontalist Model

- The banks' lending ***interest rate*** (**i**) is set as a ***mark-up*** over the ***bank rate*** (**i***) set by the central bank

$$i = (1 + m)\, i^*$$

- The ***supply of loans*** (L^S) is horizontal at the level of **i**
- The ***demand for loans*** (L^D) decreases with **i** and increases with **Y**
- The ***monetary base*** (**B**) equals the banks' ***reserves*** (**R**)
  - Therefore, $CU_P = 0$ (and thus $CU_B = 0$ as well)
  - Therefore, **M = D** (only ***deposit*** money)
- Banks' ***reserves*** (**R**) are a fraction (**k**) of the ***money supply*** (**M**)

$$R = kM \quad \text{so} \quad M = R/k \quad \text{and} \quad mm = 1/k$$

POST-KEYNESIAN HORIZONTALIST MODEL

- Banks' ***assets*** consist of ***loans*** (**L**) and ***reserves*** (**R**) while banks' ***liabilities*** consist only of ***deposits*** (where **D = M**)
- Thus the banking sector's ***balance sheet*** is:

$$L + R = M + E$$

where **E** is banks' ***equity***

- Since **R = kM**, the ***supply of money*** is:

$$L + kM = M + E$$

$$(1 - k)M = L - E$$

$$M^S = -E/(1 - k) + L/(1 - k)$$

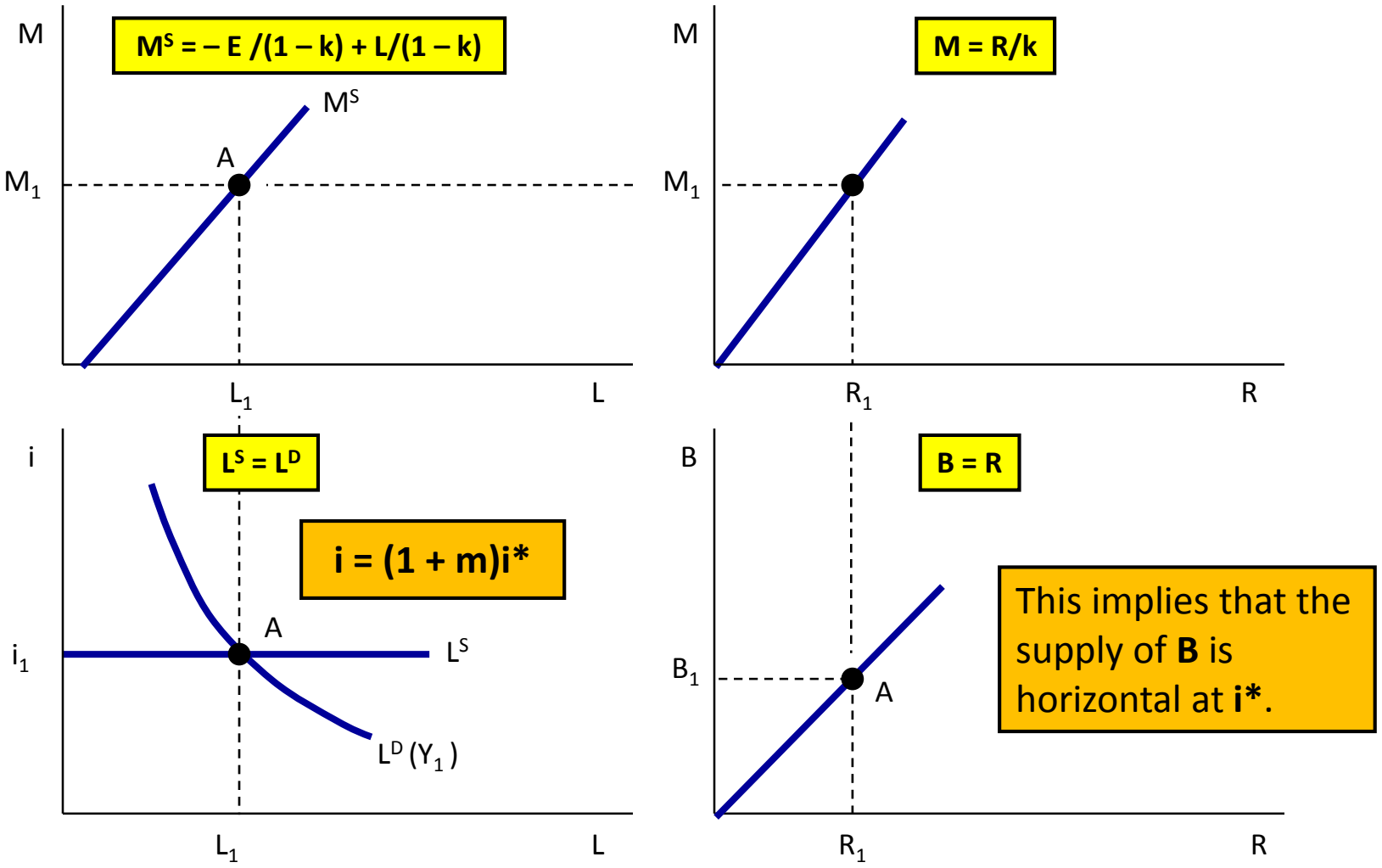
- Note that there is no ***demand for money*** in this model

POST-KEYNESIAN HORIZONTALIST MODEL (CONT'D)

- Given $M^S = -E/(1-k) + L/(1-k)$, the solution for the model is as follows:
  - **L** is determined by the ***demand for loans*** (L^D) at **i**
  - Given **L**, we thus find M^S
  - Given M^S, we find **R** $R = kM$
  - And given **R**, we find **B** (the ***monetary base***) $B = R$

- Therefore, the ***monetary base*** is also ***endogenous***
  - The Bank of Canada creates as much **B** as the banks demand

Endogenous Monetary Base in the Horizontalist Model



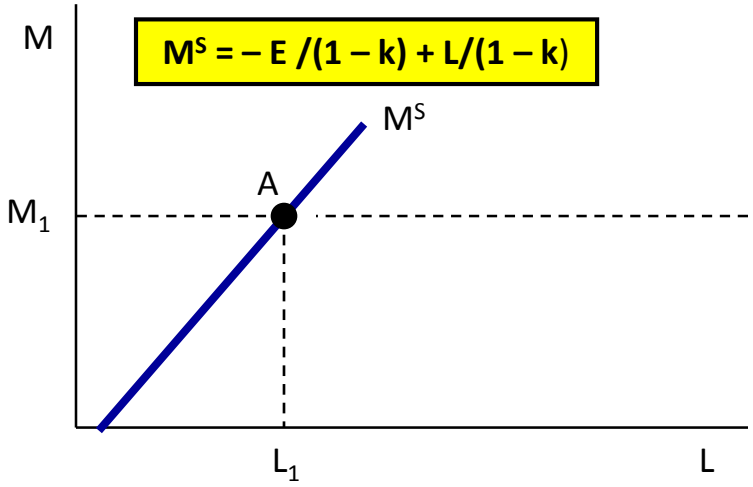
Horizontalist Model with a Positively Sloped Supply of Loans

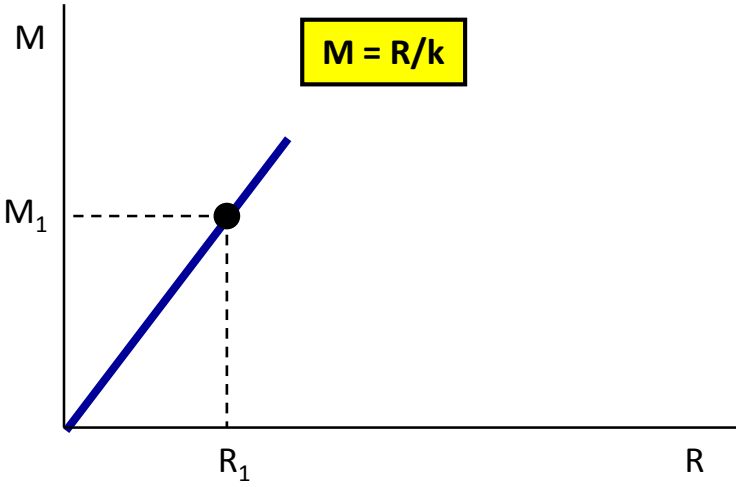
- Palley adjusts the ***horizontalist*** model by incorporating an ***upward*** sloping ***loan supply*** schedule

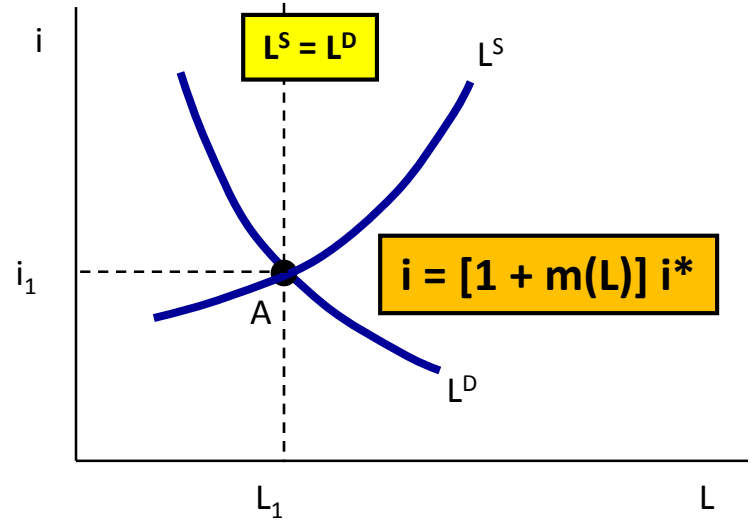
- Palley gives ***two*** possible ***reasons*** for this schedule:
  - Banks raise the ***mark-up*** as lending increases (e.g., because of greater risk)
  - The ***central bank*** increases the ***bank rate*** as the money supply increases
    - Therefore, the ***supply*** of ***monetary base*** is not horizontal

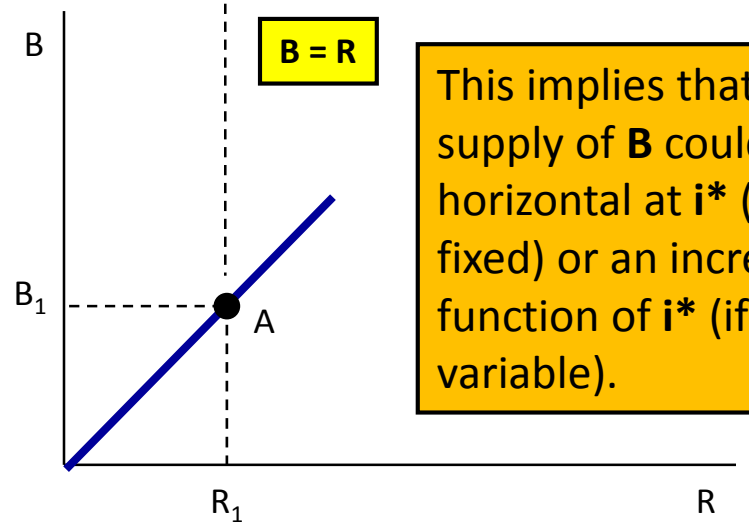
- In any case, $L^S = L^D$ at the set interest rate (i)

Horizontalist Model with Upward Sloping Loan Supply Curve









This implies that the supply of **B** could be horizontal at **i*** (if **i*** fixed) or an increasing function of **i*** (if **i*** variable).

POST-KEYNESIAN MONETARY THEORY

STRUCTURALIST MODEL

POST-KEYNESIAN STRUCTURALIST MODEL

- Like ***horizontalism***, ***structuralism*** also embodies the core logic of ***loans*** creating ***money***

- ***Structuralism*** addresses two main ***shortcomings*** of the ***horizontalist*** approach
  - The absence of ***money demand***
  - The exogeneity of ***long-term*** (***bond***) ***interest rate***

- ***Structuralism*** introduces ***money demand*** and restores Keynes's theory of ***long-term interest rate*** determination

ASSUMPTIONS OF THE POST-KEYNESIAN STRUCTURALIST MODEL

- There is no ***interest*** paid on ***deposits***
- There are three ***interest rates*** in the financial sector:
  - The short-term ***policy*** or ***bank rate*** (**i***) exogenously set by the ***monetary authority***
  - The ***lending rate*** of interest (i_L) set by the banks as a ***mark-up*** over the ***policy rate***

$$i_L = (1 + m)\, i^*$$

  - The long-term ***bond rate*** (**i**) determined by the ***money demand*** (i.e., **liquidity preference**)

Assumptions of the Post-Keynesian Structuralist Model (cont'd)

- The ***demand for money*** depends on **i** (***bond rate***), **Y** (***real income***), and **X** (***state of bearishness***)

$$M^D = M(i, Y, X)$$

where $M_i < 0$, $M_Y > 0$, and $M_X > 0$

- The ***supply of loans*** (L^S) is horizontal at the level of i_L
- The ***demand for loans*** (L^D) decreases with i_L and increases with **Y**
- The ***monetary base*** (**B**) equals the banks' ***reserves*** (**R**) which consist of ***borrowed*** (R_B) and ***non-borrowed*** (R_N) reserves

$$B = R_B + R_N = kM$$

POST-KEYNESIAN STRUCTURALIST MODEL

- Banks' ***assets*** consist of ***loans*** (**L**) and ***reserves*** (**R = kM**) while banks' ***liabilities*** consist of ***deposits*** (**M**) and borrowed reserves ($\mathbf{R_B}$)

- Thus the banking sector's ***balance sheet*** is:

$$\mathbf{L + kM = M + R_B + E}$$

where **E** is banks' ***equity***

- Therefore, the ***supply of money*** is:

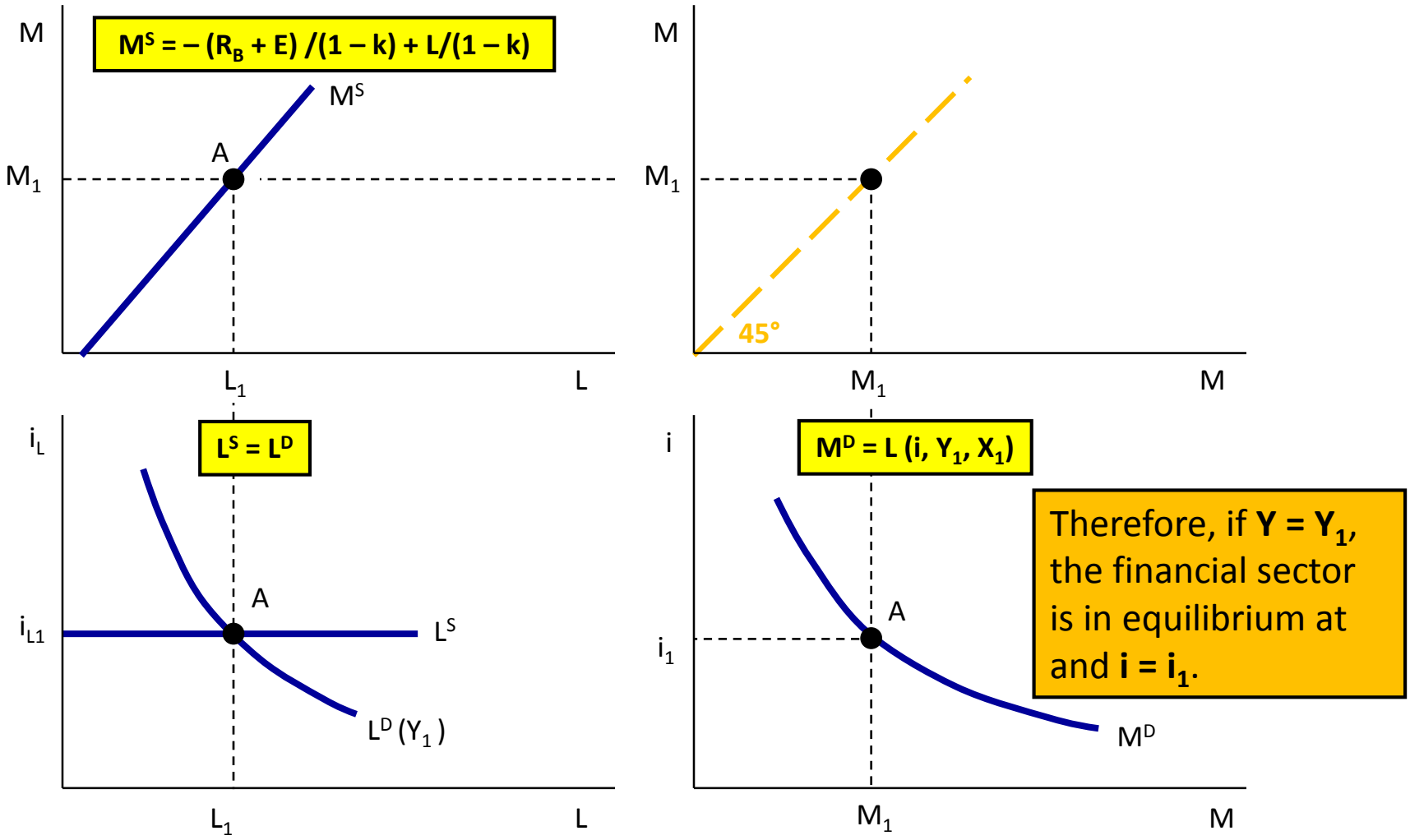
$$\mathbf{M^S = -(R_B + E)/(1 - k) + L/(1 - k)}$$

Post-Keynesian Structuralist Model (cont'd)

- Given $M^S = -(R_B + E)/(1 - k) + L/(1 - k)$, the solution for the model is as follows:
  - **L** is determined by the ***demand for loans*** (L^D) at i_L
  - Given **L**, we thus find M^S
  - Given M^S, we find **R** $R = kM$
  - And given $M^S = M^D$, we find **i**

- Therefore, the ***money supply*** and ***monetary base*** are both ***endogenous***
  - Banks' lending creates ***money***, and banks' borrowing creates ***high-powered money***

Endogenous Money Supply in the Structuralist Model



Post-Keynesian Monetary Theory

The Structuralist Model and the LM Schedule

The LM Curve in the Post-Keynesian Structuralist Model

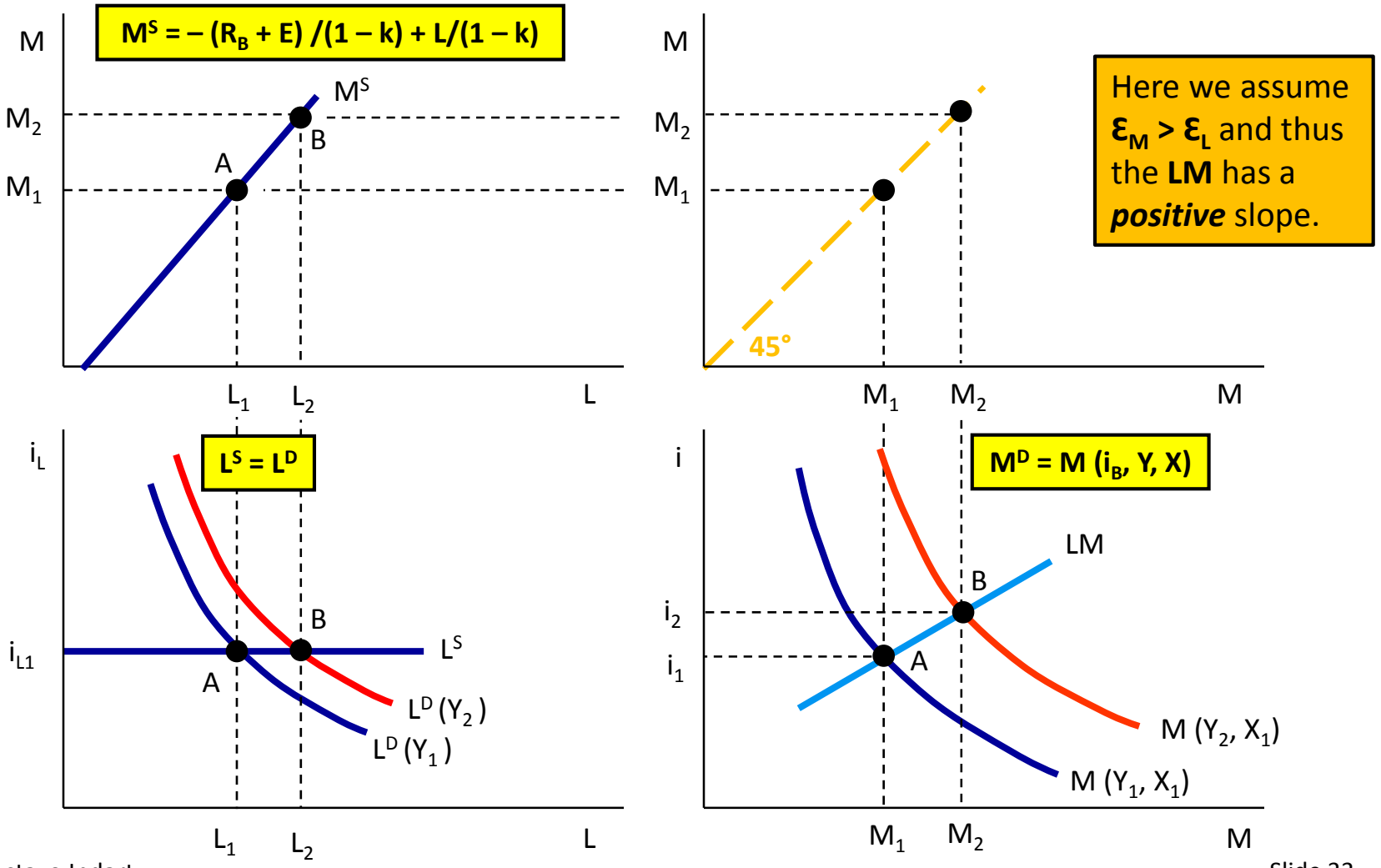
- Suppose the ***financial sector*** is initially in equilibrium as shown in slide 29
  - At $Y = Y_1$, $i = i_1$
  - This is one point on the **LM** curve

- Consider now the impact of an increase in **Y** to Y_2
  - The ***loan demand*** curve shifts to the right to $L(Y_2)$ and **L** increases to L_2
  - As **L** increases, ***deposits*** (i.e., the ***money supply***) increase along the M^S curve to M_2
  - As **Y** increases, the ***liquidity preference*** curve also shifts to the right to $M(Y_2, X_1)$

The LM Curve in the Post-Keynesian Structuralist Model

- Given the new M_2 and $M(Y_2, X_1)$, the ***bond rate*** changes to i_2
  - This is another point on the **LM** curve
- But is it $i_2 > i_1$ or $i_2 < i_1$? That is, is the slope of the **LM** curve ***positive*** or ***negative***?
- The sign of the ***slope*** of the **LM** curve is determined by the relative ***income elasticities*** of the ***demand for loans*** (ε_L) and the ***demand for money*** (ε_M)
  - If $\varepsilon_M > \varepsilon_L \rightarrow i_2 > i_1$ and **LM** has a ***positive*** slope
  - If $\varepsilon_M < \varepsilon_L \rightarrow i_2 < i_1$ and **LM** has a ***negative*** slope

The Derivation of the LM Curve in the Structuralist Model



The Derivation of the LM Curve in the Structuralist Model (cont'd)