

# MONEY, FINANCIAL SYSTEM AND MONETARY POLICY

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EE212  
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# AGENDA

- Money and financial system
- Deposit creation process
- **Interest rate determination**
- **A primer on monetary policy**

## INTEREST RATE MODEL: LIQUIDITY PREFERENCE MODEL

- Interest rate represents what an investor earns from **return on bond investment**
  - The return earned if the investor *holds bond until it get matured*
- Alternatively, it represents the **cost of bond financing**
- There are several frameworks usable for understanding the determination of interest rate
- For the purpose of policy analysis, we use the **liquidity preference model**

# INTEREST RATE MODEL: LIQUIDITY PREFERENCE MODEL

- Interest rate is determined by “**demand**” and “**supply**” of money in the **money market**
  - This model assumes two assets: **short-term bond and money**
  - The model analyzes the determination of interest by looking through the lenses of *demand and supply for money*
    - An alternative way is to look at the demand and supply for bond – loanable fund framework model (to be studied in second year course)

# BEHAVIOR OF DEMAND FOR MONEY

- Behavior of demand for money
  - What are the motives of money demand?
  - Why do people hold money for?
- Motives of money holding:
  - Transaction purpose
  - Precautionary purpose
  - Speculative purpose

# BEHAVIOR OF DEMAND FOR MONEY: TRANSACTION DEMAND FOR MONEY

- Transaction purpose
  - Holding money for the purpose of completing transaction – i.e. *payments of goods and services*
  - The determinants of transaction-based demand are *income* and *transaction technology*.
    - The higher income, the higher transaction, and hence the higher cash required
    - The better transaction technology, the lower cash required on hand

# BEHAVIOR OF DEMAND FOR MONEY: PRECAUTIONARY DEMAND FOR MONEY

- Precautionary purpose
  - Cash holding takes into account both “*expected/usual*” transactions and “*unexpected/unusual*” transactions
    - The latter requires some managements – guarding against *random liquidity needs*
  - The determinant of precautionary-based demand include “income”
    - The more income; the more precautionary demand for money can be

# BEHAVIOR OF DEMAND FOR MONEY: SPECULATIVE DEMAND FOR MONEY

- Speculative purpose
  - Conventional story that you may have heard before – *the opportunity cost*
    - Rising interest rate → higher opportunity cost of money holding → quantity demanded for money drops!
  - Keynes argued that the effect of change in interest rate affects the behavior for money demand via *expectations and speculative force*
    - To understand this, let's discuss about the nature of bond investment

## BEHAVIOR OF DEMAND FOR MONEY: SPECULATIVE DEMAND FOR MONEY

- Investors invest on bonds because *they expect to earn the return from bond investment*
- Return on bond investment is normally equal to interest rate if the investor holds bond until it get matured
- But if the investor holds bond for only short-period of time *for the speculative purpose*, bond return will depend on (i) purchased price, and (ii) resell price
  - This is referred to *capital gain / capital loss*

# BEHAVIOR OF DEMAND FOR MONEY: SPECULATIVE DEMAND FOR MONEY

- An observation that we can note from investment theory is that bond price negatively relate to interest rate
  - A drop in interest rate will be associated with an increase in bond price
- Once the price of bond increased, Keynes argued that investors will worry if the price of bond will drop later – *creating an expectation in capital loss*
- *For the speculative reasoning*, investor will choose to hold more on money instead, *wait for a better investment opportunity on bonds*
  - As a result, quantity of money holding negatively relates to interest rate

# INTEREST RATE MODEL: LIQUIDITY PREFERENCE MODEL

- Given the three motives, Keynesian proposed the following *money demand function*

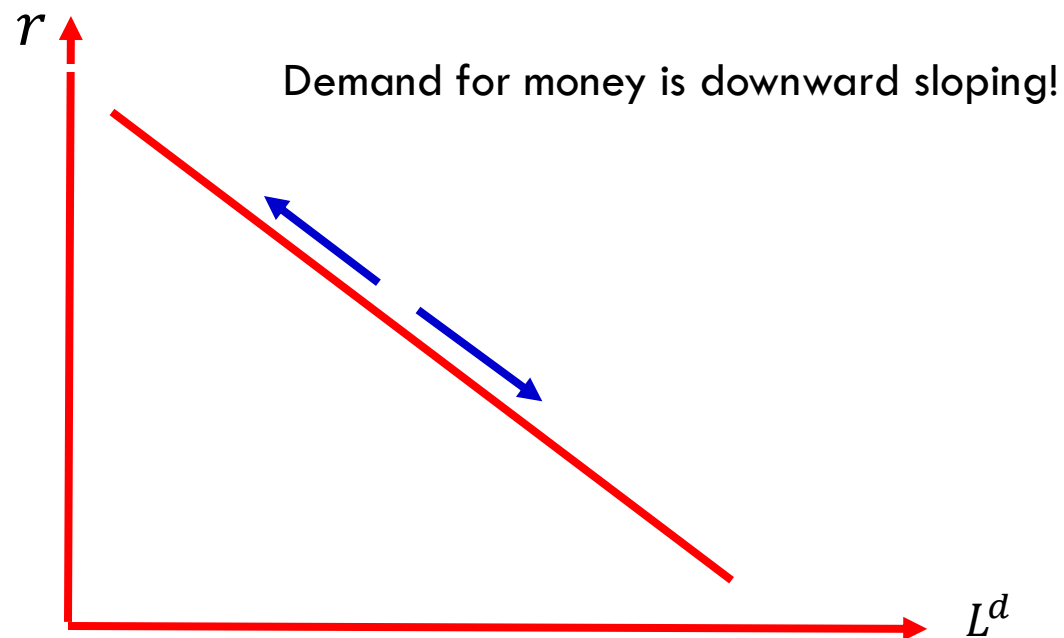
$$L^d = L(Y, r)$$

- $L^d$ : *Real* money balance (Quantity of money holding in real term)
- $Y$ : Real income
- $r$ : Interest rate

## GRAPHICAL ILLUSTRATION OF MONEY DEMAND CURVE: CHANGE IN QUANTITY DEMANDED FOR MONEY

- Changed in quantity demanded for money = **movement along demand curve**

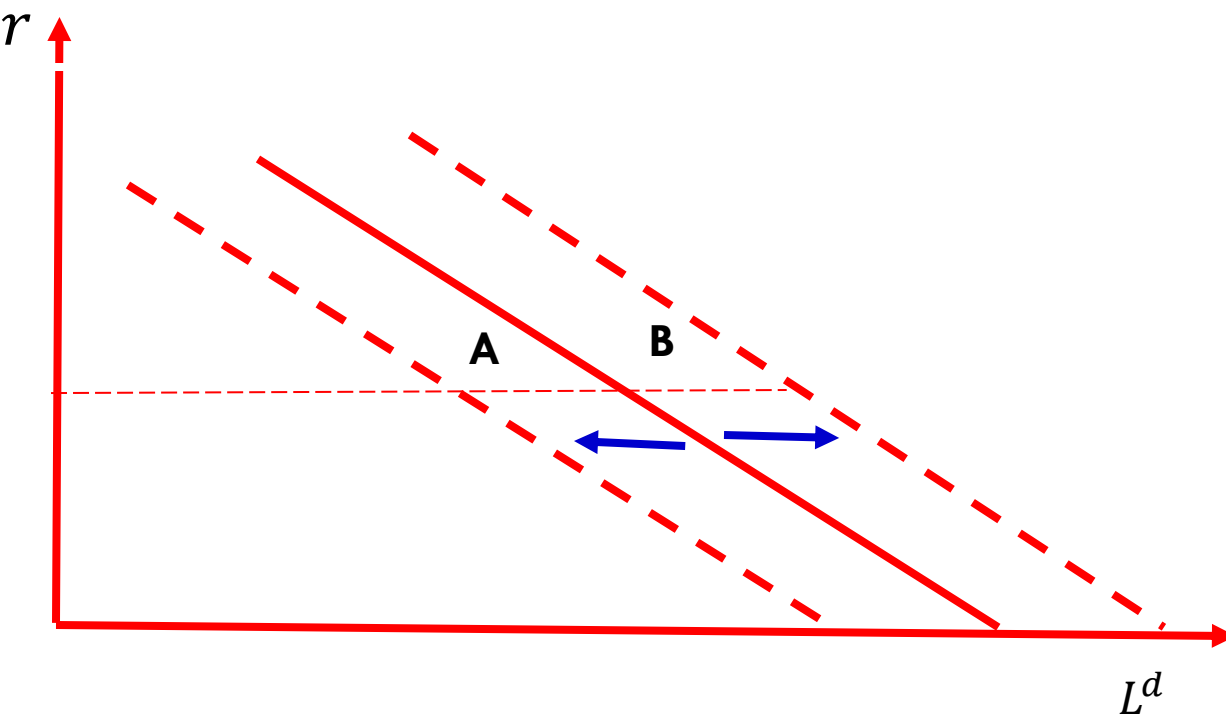
- Economists plot real money demand with respect to the interest rate



- **Given other factors fixed**, the quantity of real money demanded drops
- Demand for money is downward sloping!

## GRAPHICAL ILLUSTRATION OF MONEY DEMAND CURVE: CHANGE IN MONEY DEMAND CURVE

- **Change in the demand curve = shifting the curve**

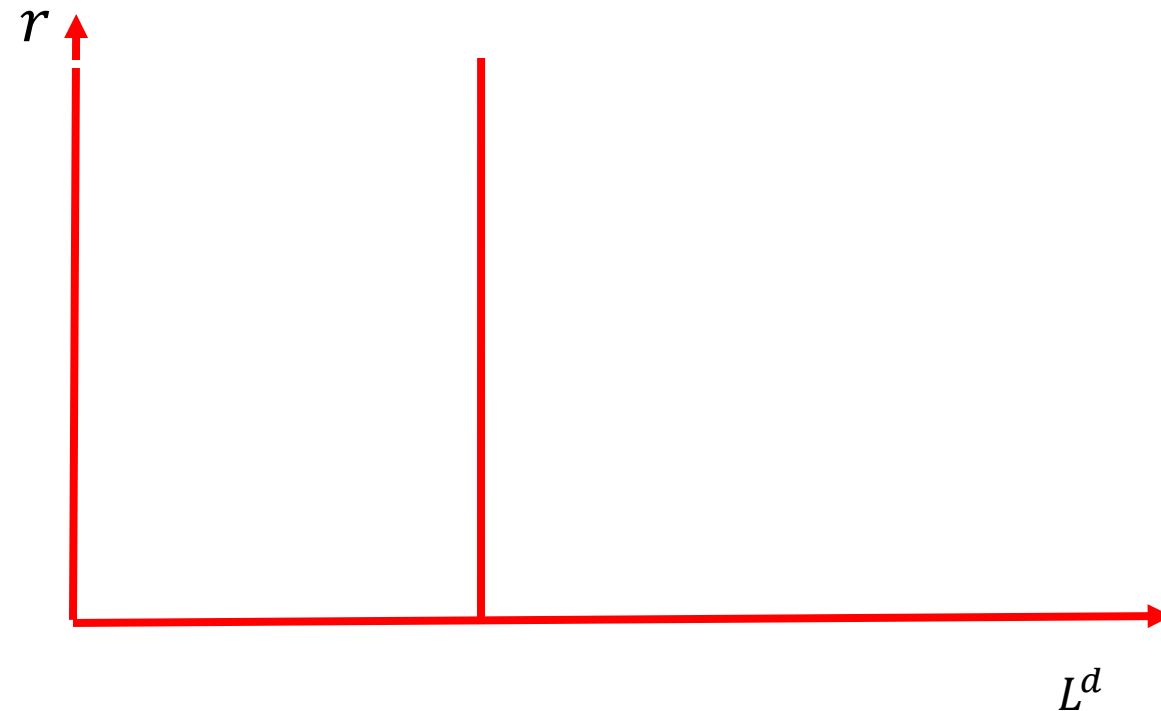


- The whole money demand curve can be changing if the determinants for money demand change
  - Income changes
  - Level of technology
  - Riskiness of other assets
- These changes capture the increase/decrease of money demand, driven by factors other than interest rate
  - A: Quantity of money demanded decreases for every level of interest rate (Shift left)
  - B: Quantity of money demanded increases for every level of interest rate (Shift right)

# GRAPHICAL ILLUSTRATION OF REAL MONEY SUPPLY: MOVEMENT ALONG THE REAL MONEY SUPPLY CURVE

- **Real money supply curve**

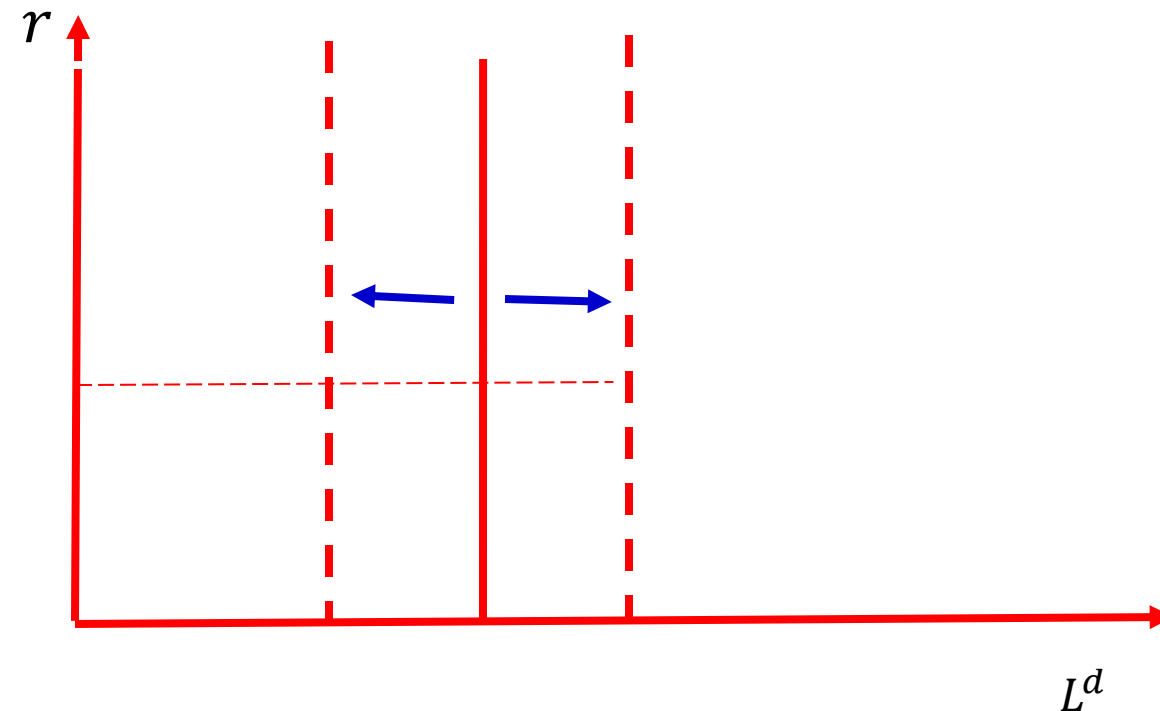
- The *nominal level of Money supply* can be controlled by the central bank, i.e. treated as given
- Given the fixed in price level, the *level of real money supply will be treated as given as well!*
- The real money supply curve is a vertical line!



# GRAPHICAL ILLUSTRATION OF REAL MONEY SUPPLY: CHANGE IN REAL MONEY SUPPLY CURVE

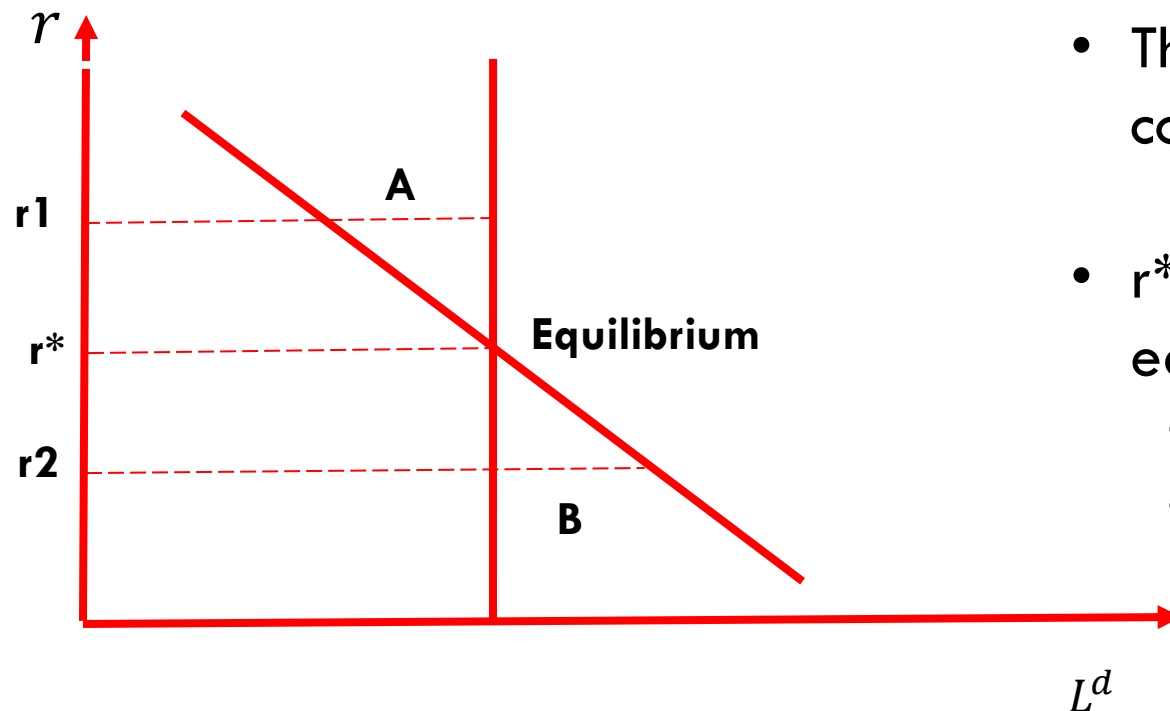
- **Real money supply curve**

- Real money supply can rise and fall
  - The nominal level of money supply changes
  - The level of price changes
- **Example:** With a rise (fall) in the nominal level of money supply, the real money supply curve will shift to the right (left)



# EQUILIBRIUM DETERMINATION

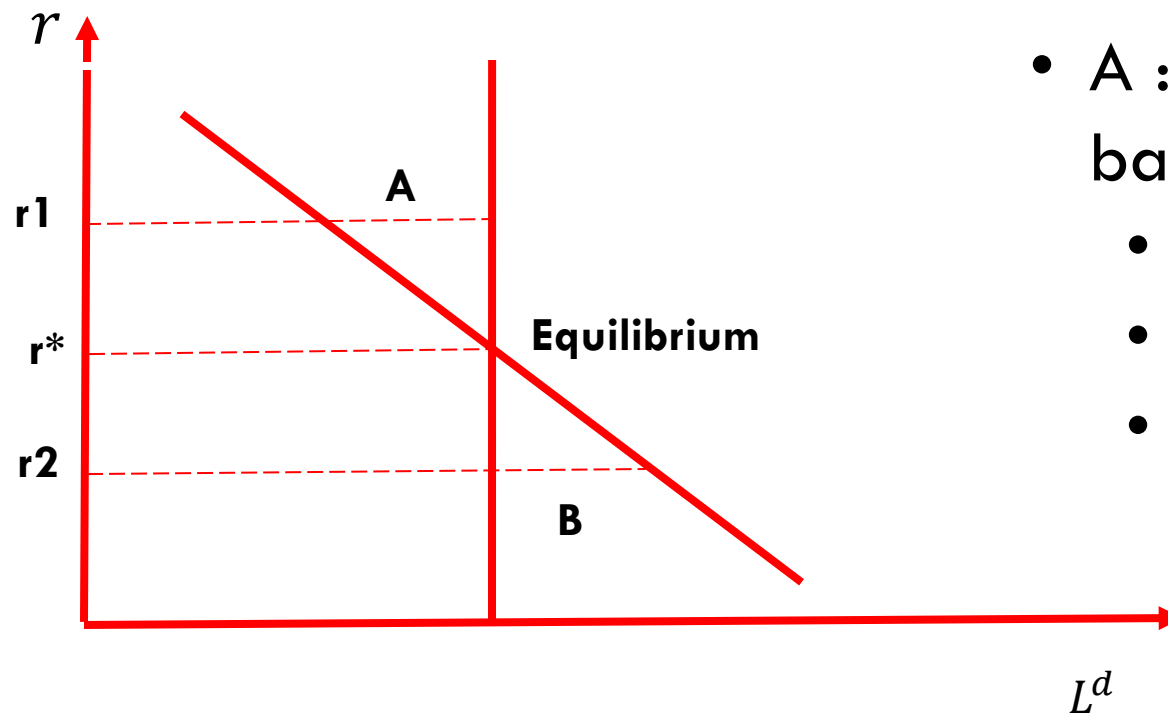
- **Equilibrium**



- The equilibrium interest rate is pinned down by the condition money demand and money supply
- $r^*$  is the equilibrium where real money demand equates with real money supply
  - A : Excess supply for real money balance
  - B : Excess demand for real money balance

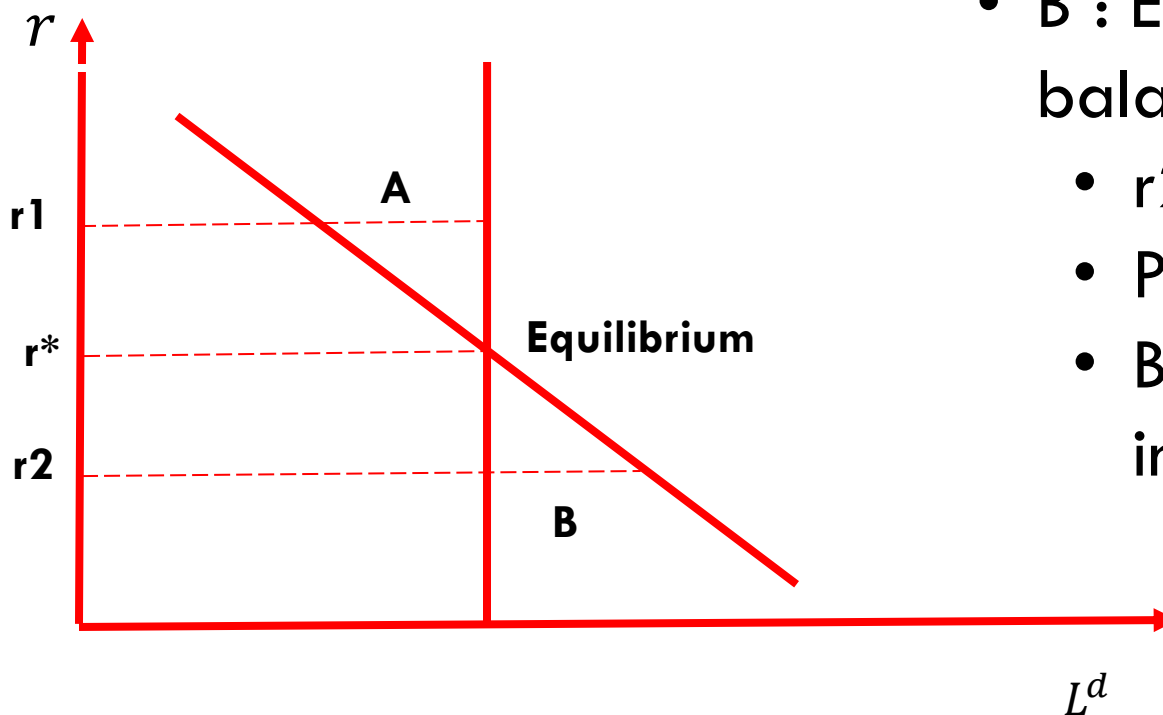
# ADJUSTMENT TOWARDS THE EQUILIBRIUM

- **Equilibrium adjustment**



- A : Excess supply for real money balance
  - $r_1$ : more money than needed
  - People allocate money to buy bond
  - Bond price increases  $\rightarrow$  interest rate falls to equilibrium  $r^*$

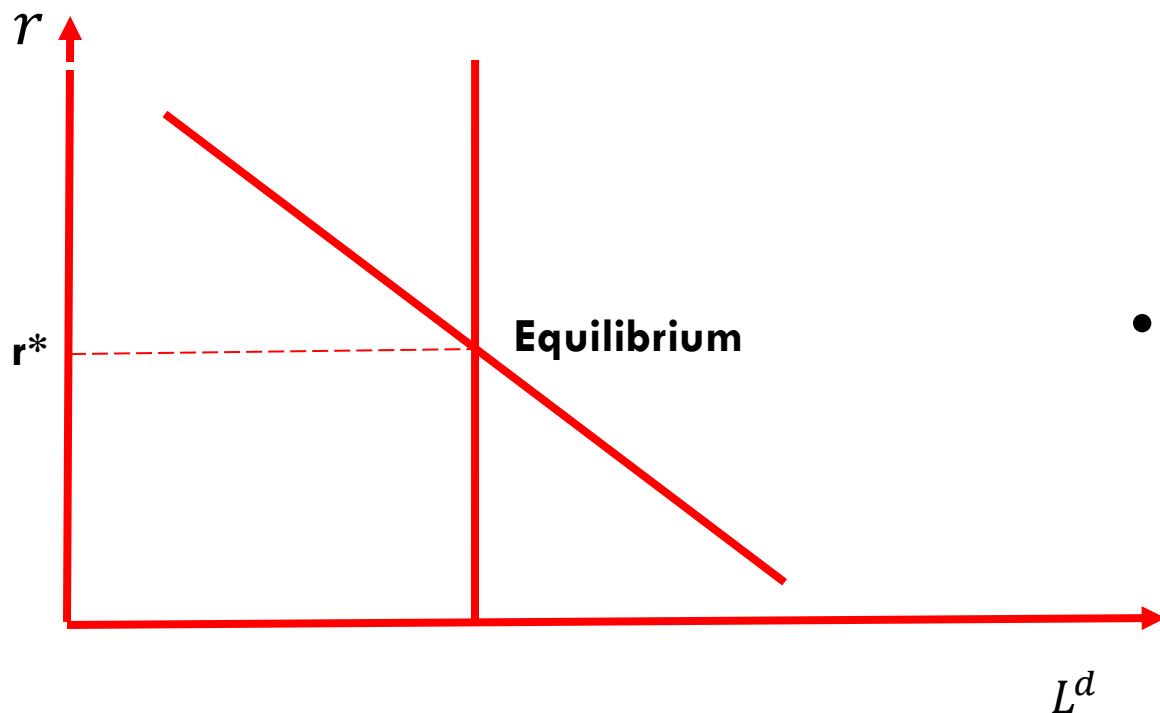
## ADJUSTMENT TOWARDS THE EQUILIBRIUM



- **Equilibrium adjustment**

- B : Excess supply for real money balance
  - $r_2$ : less money than needed
  - People sell bond to get money
  - Bond price drops  $\rightarrow$  interest rate increases to reach equilibrium  $r^*$

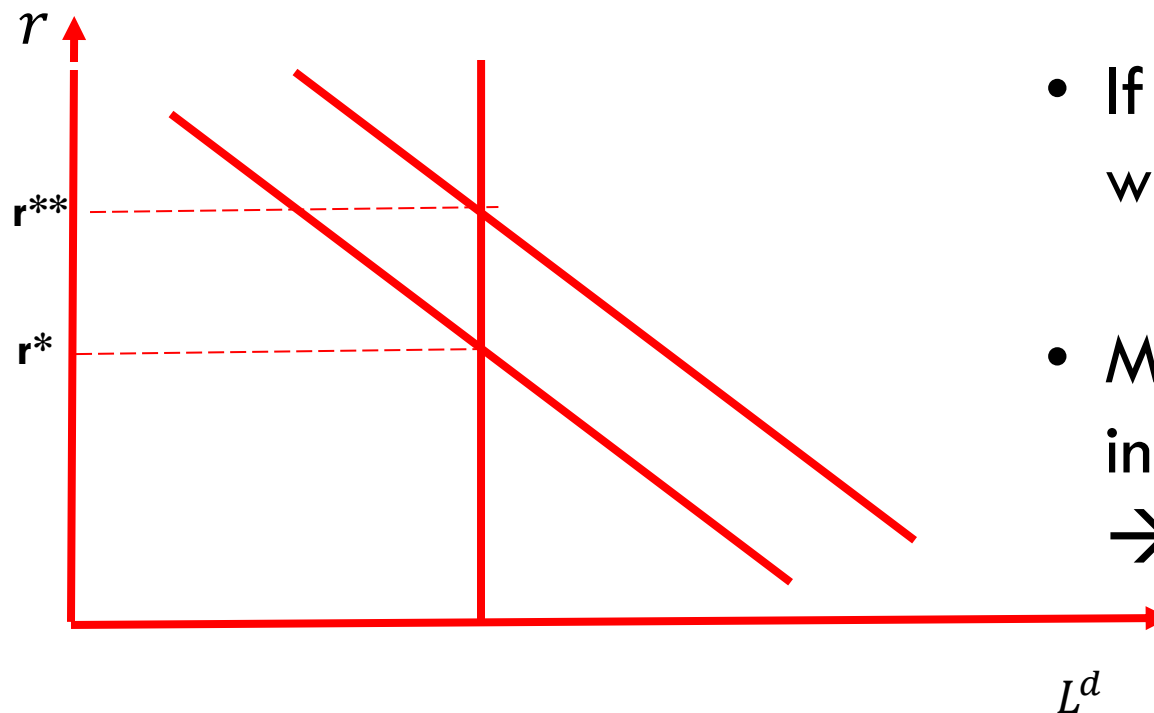
## CHANGES IN THE EQUILIBRIUM INTEREST RATE



- In the real world, interest rate moves over course of time.
- What cause the movement in the equilibrium interest rate?
  - A better question asked *is “what cause the change in the equilibrium interest rate?”*
- Changes in the equilibrium interest rate occurs because of
  - Change in demand for money: changes that shift the money demand curve
  - Change in the real money supply: changes that shift the money supply curve

## CHANGES IN THE EQUILIBRIUM INTEREST RATE

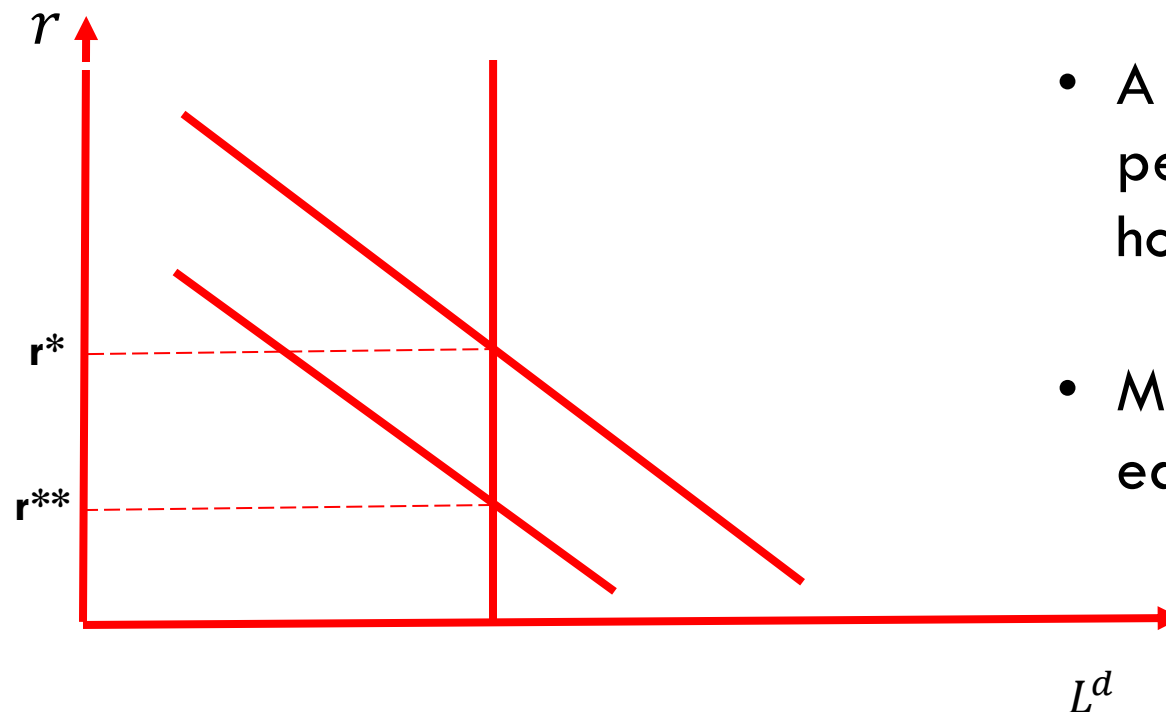
- **Example:**



- If income increases, demand for money will rise
- Money demand curve shifts, causing an increase in equilibrium interest rate;  $r^* \rightarrow r^{**}$

## CHANGES IN THE EQUILIBRIUM INTEREST RATE

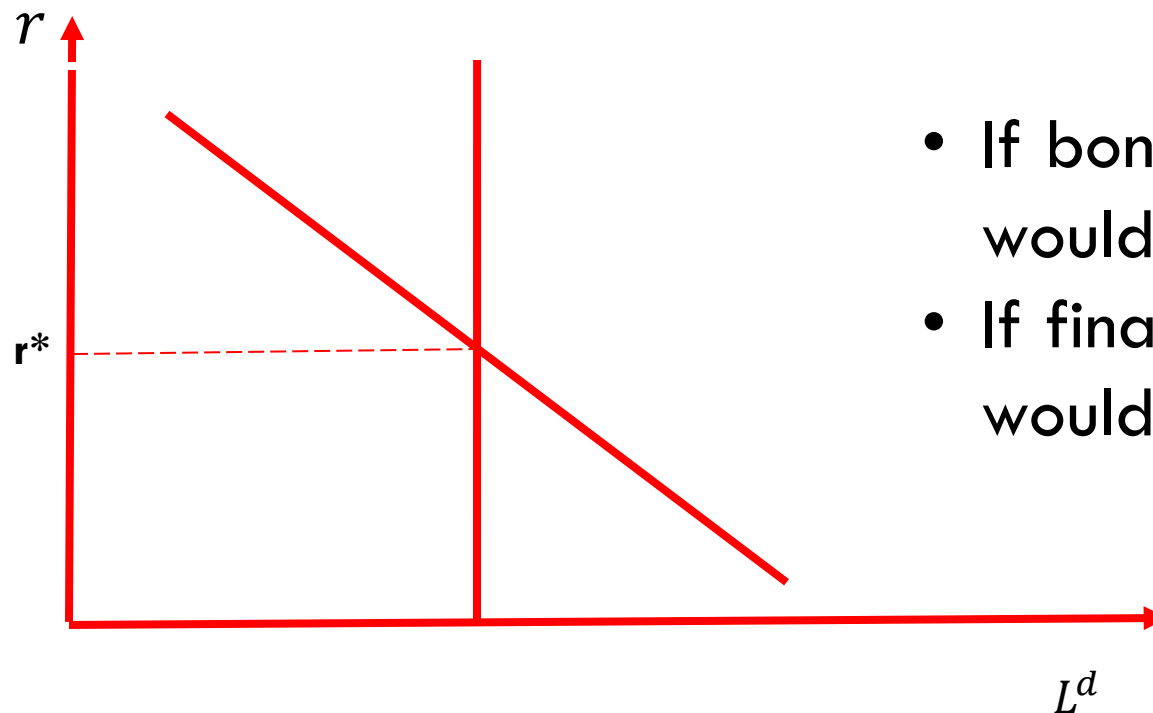
- **Example:**



- A better payment technology can change people's behavior of money holding – holding less cash
- Money demand curve shifts left  $\rightarrow$  equilibrium interest rate drops from  $r^*$  to  $r^{**}$

## CHANGES IN THE EQUILIBRIUM INTEREST RATE

- **Question?**

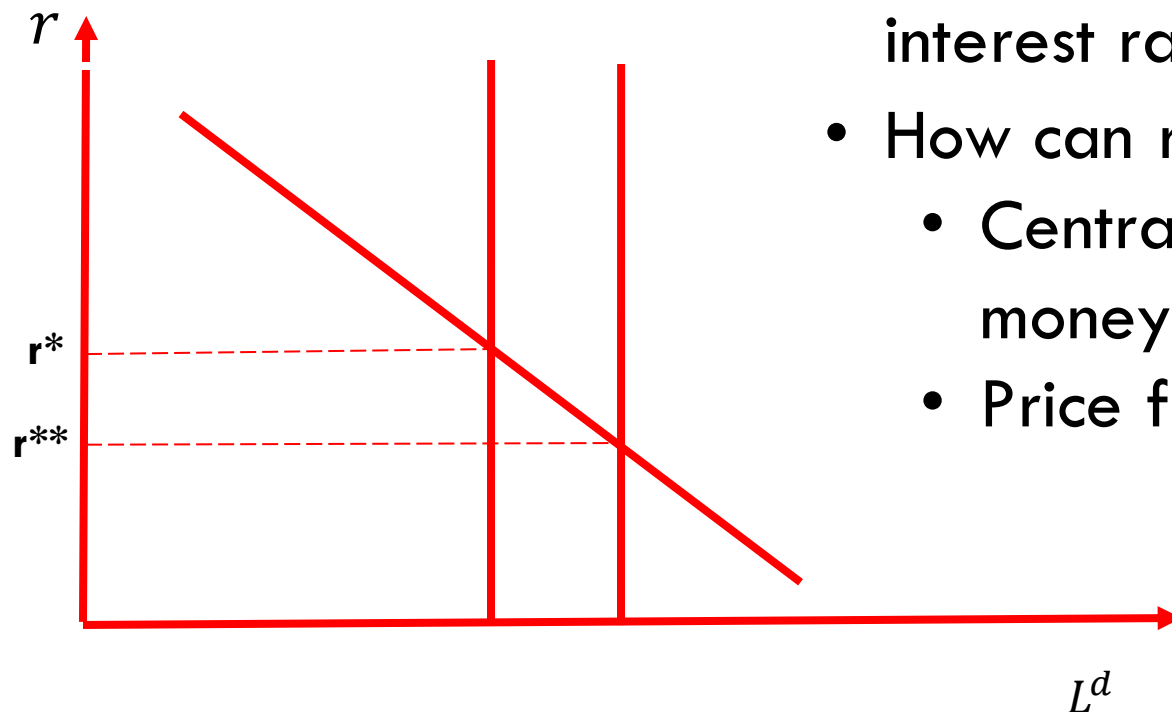


- If bond investment is even more risky, what would happen to the interest rate?
- If financial sector is under trouble, what would happen to the interest rate?

## CHANGES IN THE EQUILIBRIUM INTEREST RATE

- **Example**

- If real money supply increases (more liquidity), interest rate will drop by  $r^*$  to  $r^{**}$
- How can real money supply increase?
  - Central bank increases “nominal” level of money supply
  - Price falls



# WHAT DOES A CENTRAL BANK DO?

- Functions of the *central bank*
  - Financial supervision
    - Monitor the operation of commercial banks
    - Setting rules and regulations to ensure healthy financial condition
  - Payments system:
    - Check clearing process
  - *Conduct of monetary policy*

# WHAT IS MONETARY POLICY?

- Monetary policy
  - Controlling *money supply* and adjust the *interest rate*
- The ultimate aim of this control is to *keep inflation low* and *promote economic growth*

# TYPES OF MONETARY POLICY

- Types of monetary policy
  - Expansionary monetary policy
    - Recession / Deflation
    - Injecting liquidity to boost money supply, and lower interest rate
  - Contractionary (Tight) monetary policy
    - Boom/ Bubble/ Inflation
    - Absorbing liquidity to lower money supply, and increase interest rate

# MONETARY POLICY TOOLS

- To control and adjust the level of money supply, central bank adopts the following tools / instruments
  - Change in the level of reserve requirement
  - Change in the level of discount rate
    - **Discount rate:** cost of borrowing charged to Commercial banks.
  - Open market operation
    - **OMO:** operation initiated by central bank; to purchase or to sell government bond

# INTERLINK AMONG PLAYERS

- To understand the effect of *monetary policy operations*, we need to look how central bank *connects/interlinks* with other players in the financial system
  - The easiest way to is to look at the *sectoral balance sheet*
- We divide the players into three parts; *central bank, commercial banks, and households*

# SECTORAL BALANCE SHEETS: SIMPLIFIED ONE

## *central bank*

| Assets                         | Liabilities |
|--------------------------------|-------------|
| Gold                           | Currency    |
| Foreign currency               | Reserve     |
| Government bond                |             |
| Loan to financial institutions |             |

## *commercial banks*

| Assets                             | Liabilities |
|------------------------------------|-------------|
| Reserve                            | Deposits    |
| Foreign currency                   | Borrowings  |
| Government bond                    |             |
| Loans to households and businesses |             |

## *households*

| Assets          | Liabilities                          |
|-----------------|--------------------------------------|
| Currency        | Loans obtained from commercial banks |
| Deposits        |                                      |
| Government bond |                                      |

# SECTORAL BALANCE SHEETS: MONETARY BASE

## *central bank*

| Assets                         | Liabilities     |
|--------------------------------|-----------------|
| Gold                           | <i>Currency</i> |
| Foreign currency               | <i>Reserve</i>  |
| Government bond                |                 |
| Loan to financial institutions |                 |

**Money base; Monetary based; High-powered money**

$$\text{MB} = \text{Currency} + \text{Reserve}$$

**Considered as central bank's liabilities**

**Why is it important?**

**Change in MB → Change in Money supply!**

## *commercial banks*

| Assets                             | Liabilities |
|------------------------------------|-------------|
| Reserve                            | Deposits    |
| Foreign currency                   | Borrowings  |
| Government bond                    |             |
| Loans to households and businesses |             |

## *households*

| Assets          | Liabilities                          |
|-----------------|--------------------------------------|
| Currency        | Loans obtained from commercial banks |
| Deposits        |                                      |
| Government bond |                                      |

# MONETARY BASE AFFECTS MONEY SUPPLY: CHANGE IN CURRENCY

## *central bank*

| Assets                       | Liabilities     |
|------------------------------|-----------------|
| Gold                         | <b>Currency</b> |
| Foreign currency             | Reserve         |
| Government bond              |                 |
| Loan to financial intuitions |                 |

**Example:**  
**Currency increases → Money supply increases**

## *commercial banks*

| Assets                             | Liabilities |
|------------------------------------|-------------|
| Reserve                            | Deposits    |
| Foreign currency                   | Borrowings  |
| Government bond                    |             |
| Loans to households and businesses |             |

## *households*

| Assets          | Liabilities                          |
|-----------------|--------------------------------------|
| <b>Currency</b> | Loans obtained from commercial banks |
| Deposits        |                                      |
| Government bond |                                      |

# MONETARY BASE AFFECTS MONEY SUPPLY: CHANGE IN RESERVE → CHANGE IN DEPOSIT

*central bank*

| Assets                         | Liabilities    |
|--------------------------------|----------------|
| Gold                           | Currency       |
| Foreign currency               | <b>Reserve</b> |
| Government bond                |                |
| Loan to financial institutions |                |



*commercial banks*

| Assets                             | Liabilities     |
|------------------------------------|-----------------|
| <b>Reserve</b>                     | <b>Deposits</b> |
| Foreign currency                   | Borrowings      |
| Government bond                    |                 |
| Loans to households and businesses |                 |

*households*

| Assets          | Liabilities                          |
|-----------------|--------------------------------------|
| Currency        | Loans obtained from commercial banks |
| Deposits        |                                      |
| Government bond |                                      |

**Example:**

**Reserve increases**

- Banks have more funding
- Deposit creation will work
- Total deposit rises
- Money supply increases

# HOW TO CHANGE MONETARY BASE?

- As changes in monetary base can lead to the change in money supply, the question is how to change monetary base?
- To change monetary base, central bank adopts some *instruments / tools*
- Let's look at how tools of monetary policy impact monetary base, and hence the level of money supply – the narrowly defined one, C+D

# OPEN MARKET OPERATION

- How does a change in the open market operation affect money supply?
- Suppose that we consider the impact of **an OMO purchase**
  - Central bank buys government bond from market.
    - Household
    - Commercial bank
  - Total deposit created within the banking system will rise
  - Money supply ( $C + D$ ) will rise at the end

# OPERATIONAL DETAIL VIA BALANCE SHEET: EFFECT OF OMO PURCHASE WITH BANKS

## central bank

| Assets                         | Liabilities    |
|--------------------------------|----------------|
| Gold                           | Currency       |
| Foreign currency               | <b>Reserve</b> |
| <b>Government bond</b>         |                |
| Loan to financial institutions |                |

## commercial banks

| Assets                             | Liabilities     |
|------------------------------------|-----------------|
| <b>Reserve</b>                     | <b>Deposits</b> |
| Foreign currency                   | Borrowings      |
| <b>Government bond</b>             |                 |
| Loans to households and businesses |                 |

## households

| Assets                 | Liabilities                          |
|------------------------|--------------------------------------|
| Currency               | Loans obtained from commercial banks |
| Deposits               |                                      |
| <b>Government bond</b> |                                      |

### OMO purchase with Banks

- Banks get more reserve
- They can create more loan using the excess reserve
- Checking deposits increase
- Money supply rises!

# OPERATIONAL DETAIL VIA BALANCE SHEET: EFFECT OF OMO PURCHASE WITH HOUSEHOLDS

## central bank

| Assets                         | Liabilities     |
|--------------------------------|-----------------|
| Gold                           | <b>Currency</b> |
| Foreign currency               | Reserve         |
| <b>Government bond</b>         |                 |
| Loan to financial institutions |                 |

## commercial banks

| Assets                             | Liabilities |
|------------------------------------|-------------|
| Reserve                            | Deposits    |
| Foreign currency                   | Borrowings  |
| Government bond                    |             |
| Loans to households and businesses |             |

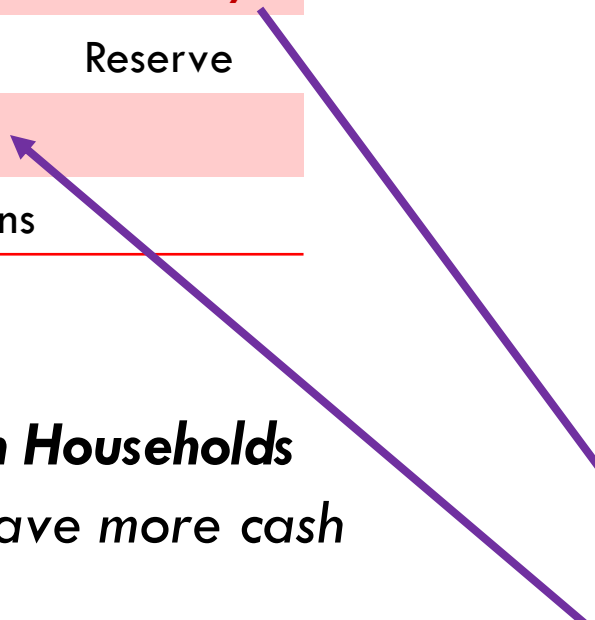
## households

| Assets                 | Liabilities                          |
|------------------------|--------------------------------------|
| <b>Currency</b>        | Loans obtained from commercial banks |
| Deposits               |                                      |
| <b>Government bond</b> |                                      |

### OMO purchase with Households

→ Households will have more cash on hand

→ Money supply rises!



# OPERATIONAL DETAIL VIA BALANCE SHEET: EFFECT OF OMO PURCHASE WITH HOUSEHOLDS

## central bank

| Assets                         | Liabilities |
|--------------------------------|-------------|
| Gold                           | Currency    |
| Foreign currency               | Reserve     |
| Government bond                |             |
| Loan to financial institutions |             |

## commercial banks

| Assets                             | Liabilities |
|------------------------------------|-------------|
| Reserve                            | Deposits    |
| Foreign currency                   | Borrowings  |
| Government bond                    |             |
| Loans to households and businesses |             |

## households

| Assets          | Liabilities                          |
|-----------------|--------------------------------------|
| Currency        | Loans obtained from commercial banks |
| Deposits        |                                      |
| Government bond |                                      |

### OMO purchase with Households

→ If the household deposits cash into banks, deposit creation will start

→ Money supply rises even more

# DISCOUNT RATE

- How does a change in the level of discount rate affect money supply?
- **Suppose a lower discount rate**
  - Bank gets incentivized to borrow from the central bank
  - Acquire additional funding sources, and hence allowing for more loan origination
  - Total deposit created within the banking system will rise
  - Money supply ( $C + D$ ) will rise at the end

# OPERATIONAL DETAIL VIA BALANCE SHEET: EFFECT OF LOWER DISCOUNT RATE

## central bank

| Assets                                | Liabilities    |
|---------------------------------------|----------------|
| Gold                                  | Currency       |
| Foreign currency                      | <b>Reserve</b> |
| Government bond                       |                |
| <b>Loan to financial institutions</b> |                |

## commercial banks

| Assets                             | Liabilities       |
|------------------------------------|-------------------|
| <b>Reserve</b>                     | <b>Deposits</b>   |
| Foreign currency                   | <b>Borrowings</b> |
| Government bond                    |                   |
| Loans to households and businesses |                   |

## Lower discount rate

- Bank might borrow more; Loan to FIS rise
- Central bank provides loan credit to FIS by adding credit balance to the commercial bank's reserve account
- As the commercial bank receives more reserve, they can start loaning and creating more deposit
- Money supply will rise

## households

| Assets          | Liabilities                          |
|-----------------|--------------------------------------|
| Currency        | Loans obtained from commercial banks |
| Deposits        |                                      |
| Government bond |                                      |

# RESERVED REQUIREMENT

- How does a change in the level of reserve requirement affect money supply?
- Suppose a **lower reserve requirement**
  - Bank can create more loan out of its deposit; less reserve required
  - Total deposit created within the banking system will rise
  - Money supply ( $C + D$ ) will rise at the end

# OPERATIONAL DETAIL VIA BALANCE SHEET: EFFECT OF LOWER RESERVE REQUIREMENT

## central bank

| Assets                         | Liabilities |
|--------------------------------|-------------|
| Gold                           | Currency    |
| Foreign currency               | Reserve     |
| Government bond                |             |
| Loan to financial institutions |             |

## commercial banks

| Assets                                    | Liabilities     |
|---|-----------------|
| <b>Reserve</b>                            | <b>Deposits</b> |
| Foreign currency                          | Borrowings      |
| Government bond                           |                 |
| <b>Loans to households and businesses</b> |                 |

## Lower required reserve

- Excess reserve available!
- Loan can be originated
- Credit line given in terms of checking deposit
- Money supply rises then

## households

| Assets          | Liabilities                          |
|-----------------|--------------------------------------|
| Currency        | Loans obtained from commercial banks |
| Deposits        |                                      |
| Government bond |                                      |