HE2002 Macroeconomics II
Lecture 2 Financial Markets I

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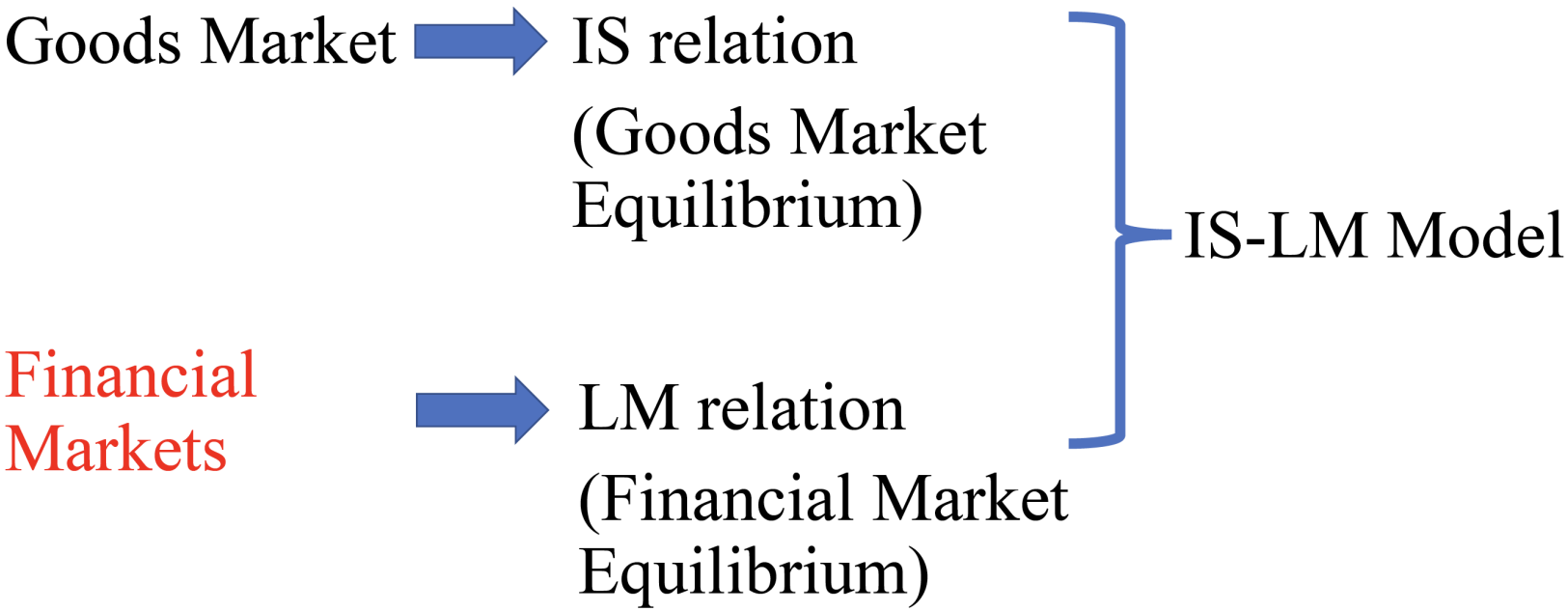
January 23, 2024

1 Lecture Outline

- The Demand for Money
- Determining the Interest Rate: I
- Determining the Interest Rate:II
- The Liquidity Trap

2 Today's Lecture



- This lecture closely aligns with the content covered in HE1002 Lectures 5, 7, and 8. We focus solely on the necessary ingredients for model construction and theoretical analysis.

3 Financial Markets

- Financial markets are intimidating, but they play an essential role in the economy.
- In this lecture, we focus on the role of the **central bank** in affecting the **interest rates**.
- We learn how the interest rate on bonds is determined, and the role of the central bank (**Federal Reserve Bank**, or the **Fed**, in the United States) in this determination.

If You are Interested in Studying Finance/Financial Markets

- HE3010 Money and Banking
- HE3012: Financial Economics
- HE3013: Economics of Corporate Finance
- We will make a lot of simplifications in Lecture 2, as well as in HE2002. Not as many details as in HE1002 (Lecture 5, 7 and 8).

4 Some Definitions

- **Money** is what can be used to pay for transactions.
- **Income** is what you earn, and it is a **flow**.
- **Saving** is the part of after-tax income that you do not spend, and it is also a **flow**.
- **Savings** is the value of what you have accumulated over time.

5 Some Definitions

- **Financial wealth**, or **wealth**, is the value of all your financial assets minus all your financial liabilities, and it is a **stock** variable.
- **Investment** is what economists refer to as the purchase of new capital goods.
- **Financial investment** is the purchase of shares or other financial assets.

Recap of HE1002 Lecture 5: Bonds

- A bond is a legal promise to repay a debt, usually including both the principal amount and regular interest (or coupon) payments

6 Money and Bonds

- Suppose you only have a choice between **two** assets: **money** and **bonds**.
- Money are used for transactions, but it pays no interest.
- Two types of money: **currency** and **checkable deposits**.
- **Bonds** pay a positive interest rate, i (the rate of interest), but cannot be used for transactions.

Note: Currency: actual physical cash, such as coins and banknotes.

Checkable Deposits: the funds held in checking accounts at banks, accessed through checks, debit cards, and electronic transfers.

7 Money Market Funds

- The holding of money and bonds depends on:
  - Your level of transactions
  - The interest rate on bonds
- You can hold bonds indirectly through **money market funds**, or money market mutual funds.
- In the early 1980s, the interest rate on money market funds reached 14% per year, so people earned more interest by moving their wealth from checking accounts to these funds.

8 More about Money Market Funds

- Money market funds (MMFs) are a type of mutual fund that invests in short-term, low-risk debt instruments, such as Treasury bills, certificates of deposit (CDs), commercial paper, and other highly liquid and low-risk securities.

- These funds are designed to provide investors with a relatively safe place to park their money while earning a modest return.

10 Best Money Market Mutual Funds of January 2024

9 The Demand for Money I

- Demand for money (M^d) is equal to **nominal income \$Y** (a measure of level of transactions in the economy) times a **decreasing** function of the interest rate i:

$$M^d = \$Y\,\underset{(-)}{L(i)} \qquad (2.1)$$

- An increase in the interest rate decreases the demand for money, as people put more of their wealth into bonds.

Note: Last week, we study the demand for goods. The \$ sign indicates we are using the nominal GDP in this equation.

10 The Demand for Money II

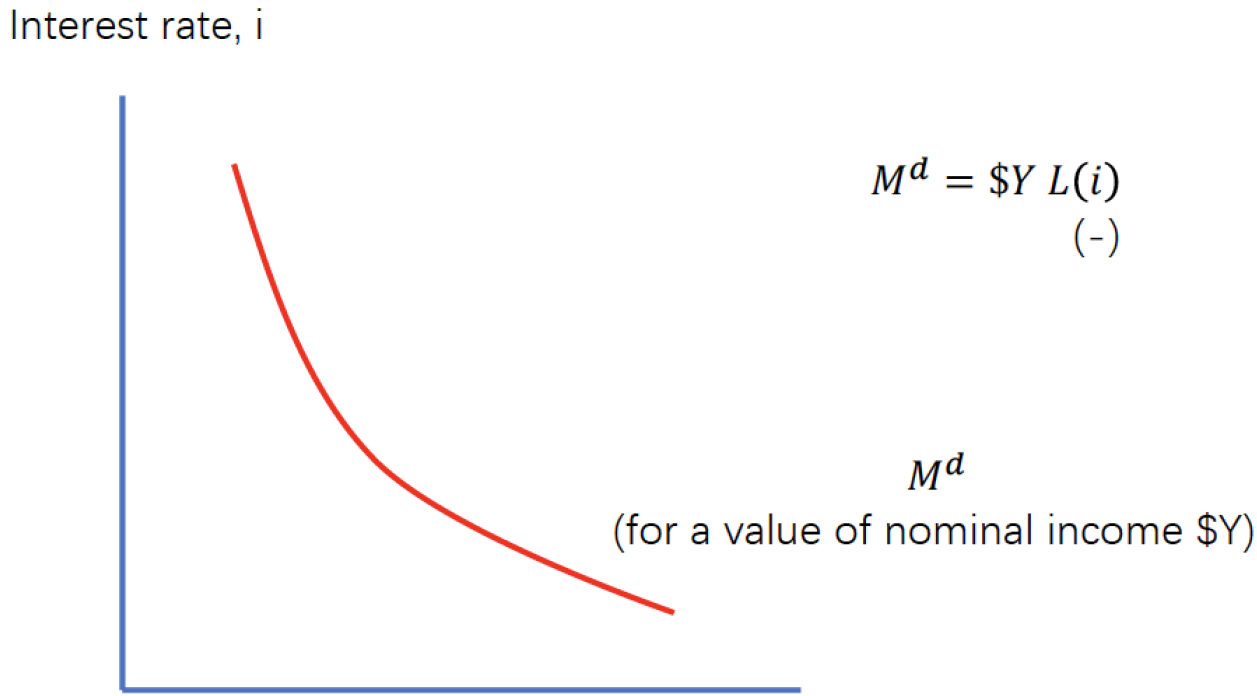
$$M^d = \$YL(i) \qquad (2.1)$$
$$(-)$$

- Equation (2.1) means that the demand for money:
  - increases in proportion to nominal income
  - depends negatively on the interest rate

Note: Last week, we study the demand for goods. The $ sign indicates we are using the nominal GDP in this equation.

11 The Demand for Money III

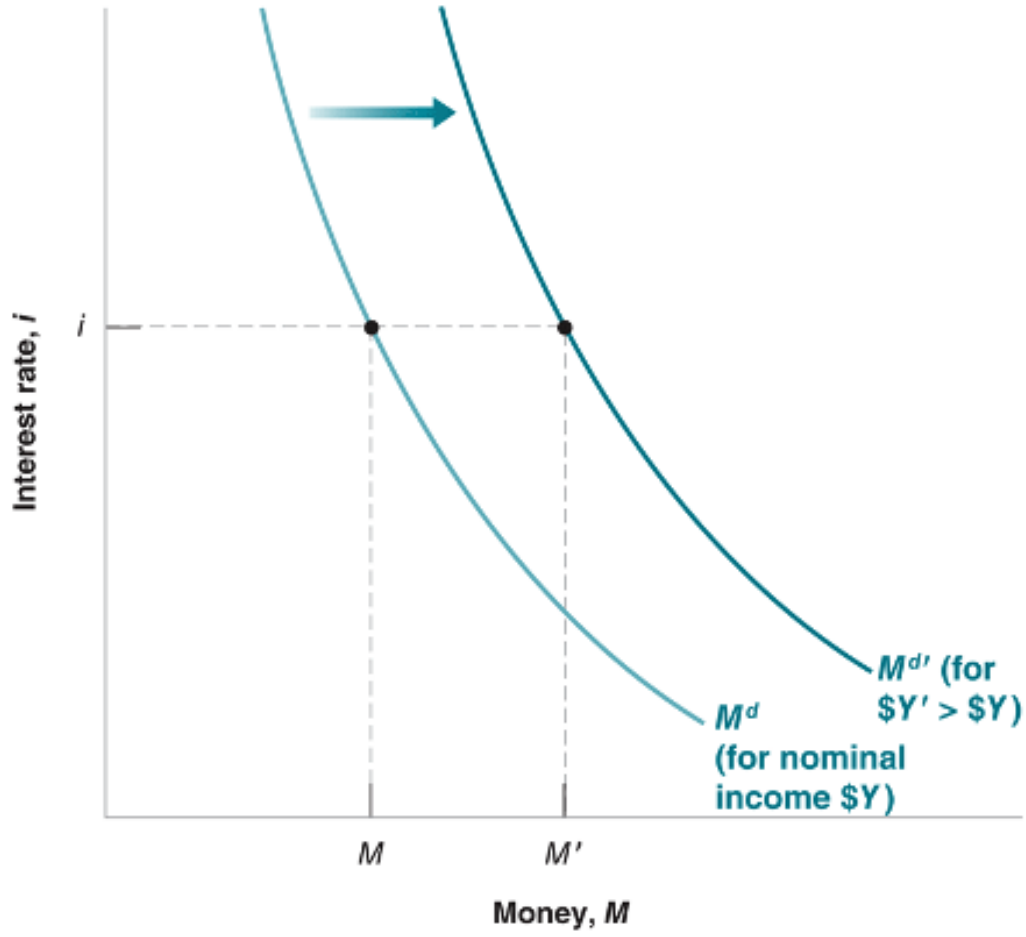
- The relation between the demand for money and interest rate for a given level of income $\$Y$ is represented by the M^d curve.



The Demand for Money

12 The Demand for Money IV

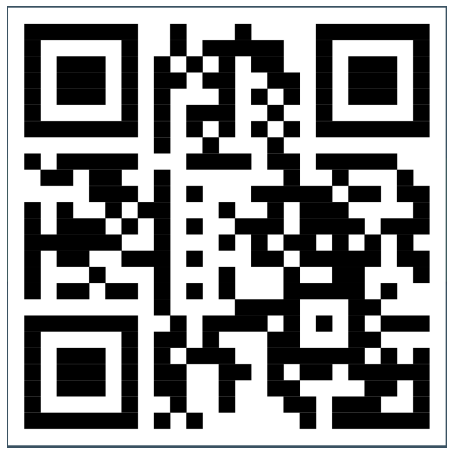
- For a given level of nominal income ($\$Y$), a lower interest rate increases the demand for money. (Movement along the curve)
- At a given interest rate, an increase in nominal income shifts the demand for money to the right. (Shifts of the curve)



Sample Question 1 (vevox ID: 116-120-129)

The money demand curve will shift to the right when which of the following occurs?

- A) a reduction in income
- B) a reduction in the interest rate
- C) an increase in the money supply
- D) all of these
- E) none of these



Recap of HE1002 Lecture 7: Central Banks

- Responsibilities of central bank:
  - Managing monetary policy
  - Ensuring smooth operation of financial markets
- The Fed controls money supply indirectly through
  - open-market operations
  - discount window lending
  - reserve requirement

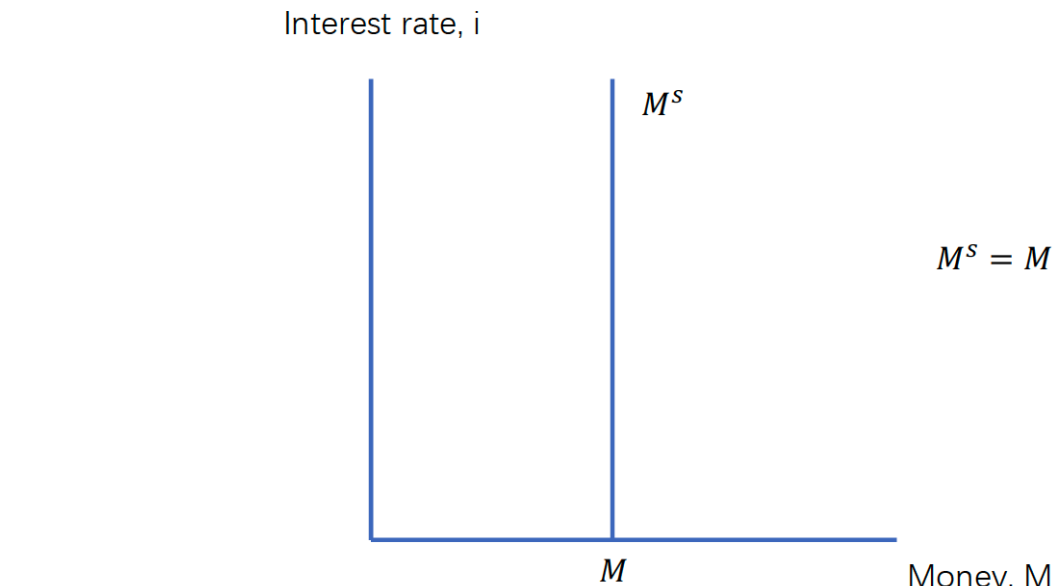
Case 1: Central Bank Only

- Assume that the central bank directly controls the supply of money and show how the interest rate is determined by the demand for money being equal to the supply of money.

13 The Supply of Money

- Suppose the central bank decides to supply an amount of money equal to M:

$$M^s = M$$



The Supply of Money

14 Equilibrium in Financial Markets

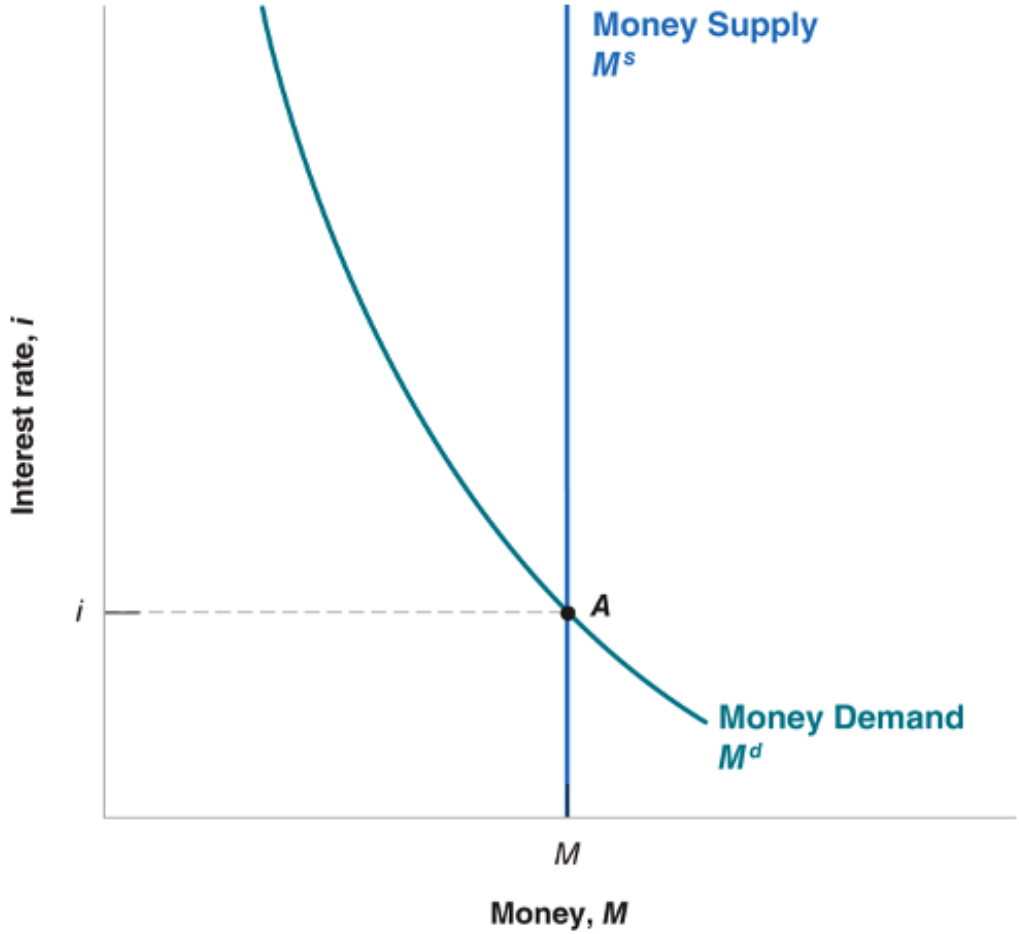
- Equilibrium in financial markets requires that $M^s = M^d = M$:

$$\text{Money supply} = \text{Money demand}$$

$$M = \$Y\ L(i) \qquad (2.2)$$

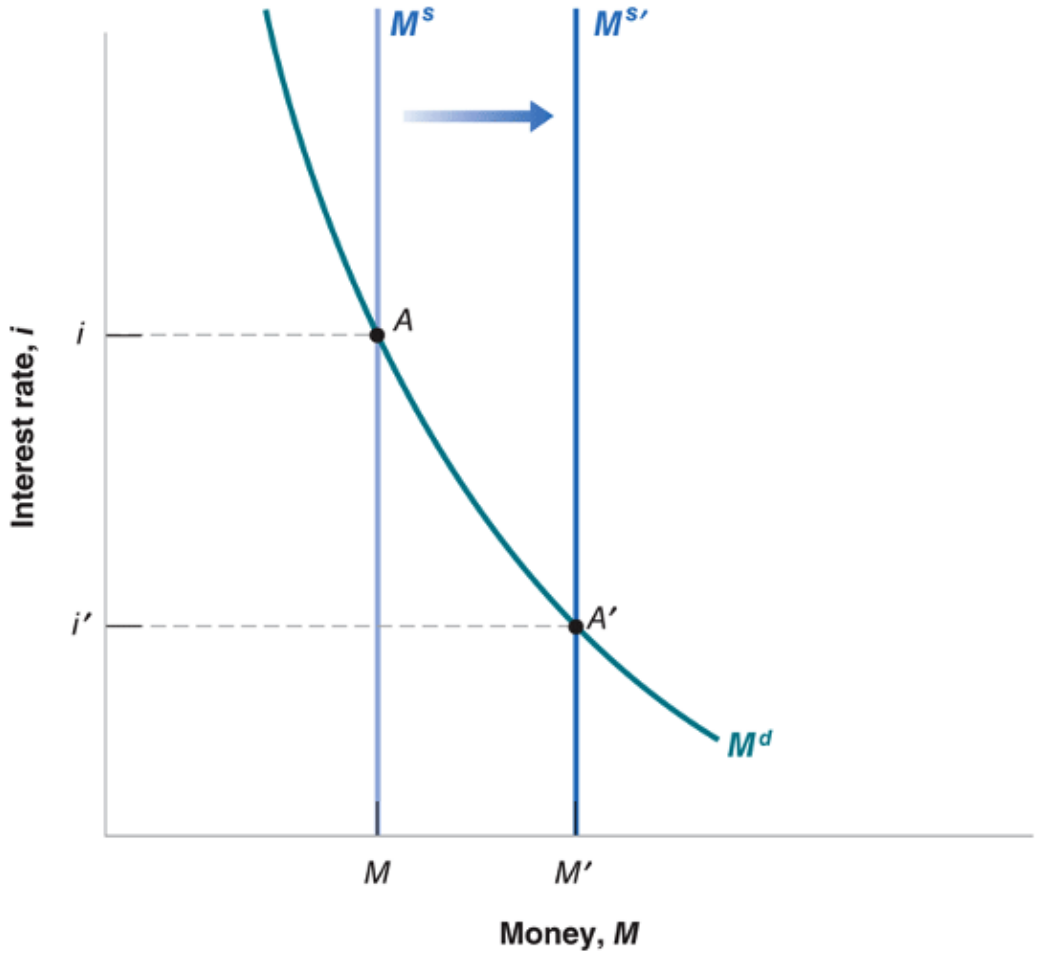
15 The Determination of the Interest Rate

- The interest rate must be such that the supply of money (which is independent of the interest rate) is equal to the demand for money (which does depend on the interest rate).



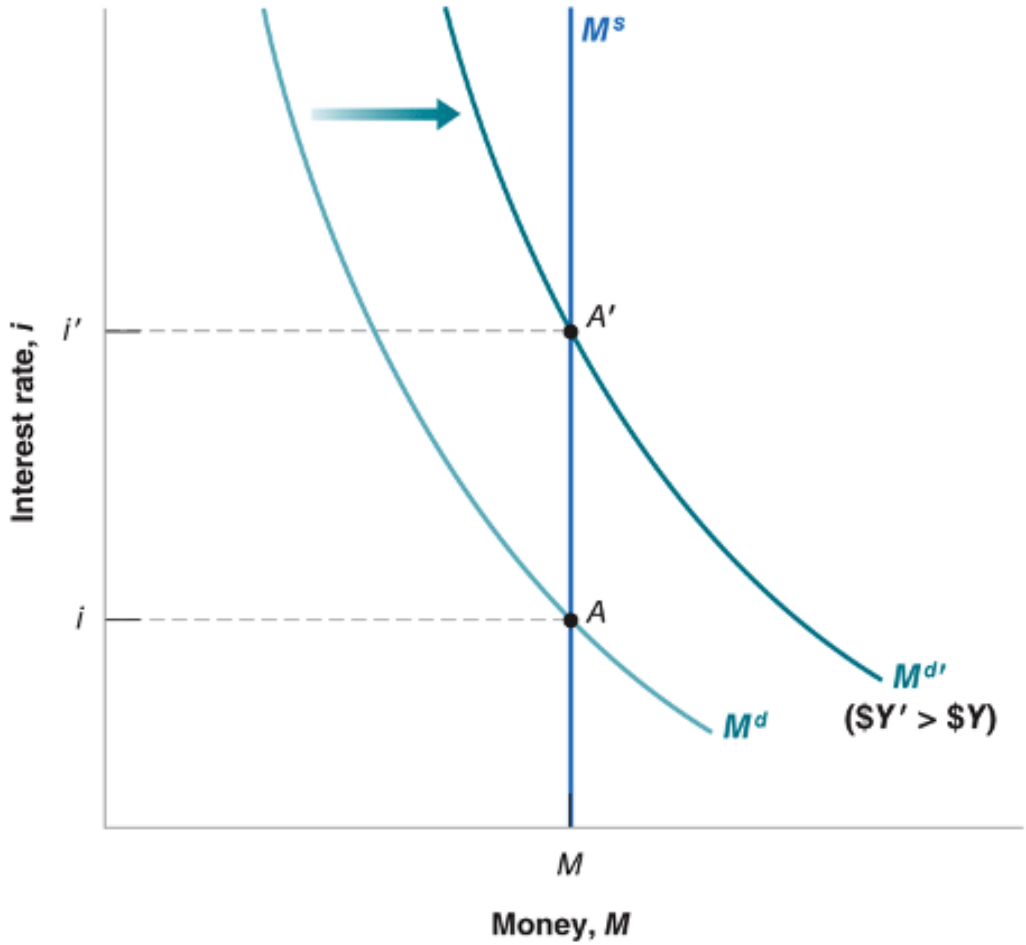
16 The Effects of an Increase in the Money Supply on the Interest Rate

- An increase in the supply of money leads to a decrease in the interest rate. (Shifts the supply of money curve to the right)



17 The Effects of an Increase in Nominal Income on the Interest Rate

- Given the money supply, an increase in nominal income leads to an increase in the interest rate. (Shifts the money demand curve to the right)



18 Open Market Operations

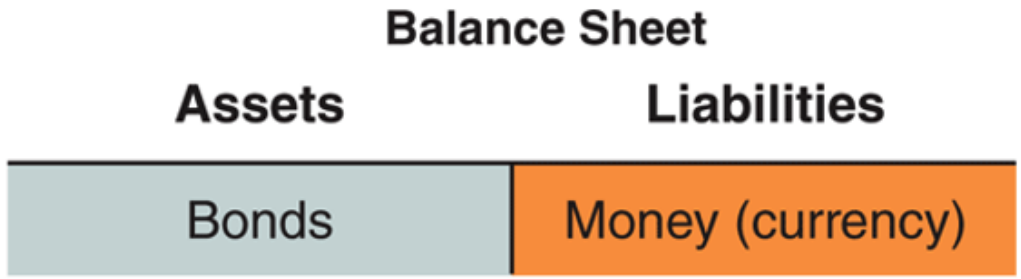
- Central banks typically change the supply of money by buying or selling bonds in the bond market - **open market operations**.
- **Expansionary open market operation**: the central bank **expands** the supply of money by buying bonds.
- **Contractionary open market operation**: the central bank **contracts** the supply of money by selling bonds.

How Do Open Market Operations Affect the U.S. Money Supply?

Policy Tools: Open Market Operations

19 The Simplified Balance Sheet of the Central Bank

- The assets of the central bank are the bonds it holds.
- The liabilities are the stock of money in the economy.



20 The Effects of an Expansionary Open Market Operation

- The assets of the central bank are the bonds it holds.
- An open market operation in which the central bank buys bonds and issues money increases both assets and liabilities by the same amount.

The Effects of an Expansionary Open Market Operation

Assets	Liabilities
Change in bond holdings: +$1 million	Change in money stock: +$1 million

21 The Interest Rate on the Bond

- Suppose a bond such as a **Treasury bill**, or **T-bill**, promises to pay \$100 a year from now.

- If the price of the bond today is $\$P_B$, then the interest rate on the bond is:

$$i = \frac{\$100 - \$P_B}{\$P_B}$$

  - The higher the price of the bond, the lower the interest rate.
  - The higher the interest rate, the lower the price today.

  ($\$P_B = \frac{100}{1+i}$)

22 Choosing the Interest Rate

- Rather than the money supply, the central bank could have chosen the interest rate and then adjusted the money supply so as to achieve the interest rate it had chosen.

- Choosing the interest rate, instead of the money supply, is what modern central banks, including the Fed, typically do.

Sample Question 2 (vevox ID: 116-120-129)

Suppose a one-year discount bond offers to pay $1000 in one year and currently sells for $950. Given this information, we know that the interest rate on the bond is

- A) 5.3%.
- B) 9.5%.
- C) 10%.
- D) 90%.
- E) 110%.

Case 2: Central Bank and (Commercial) Banks

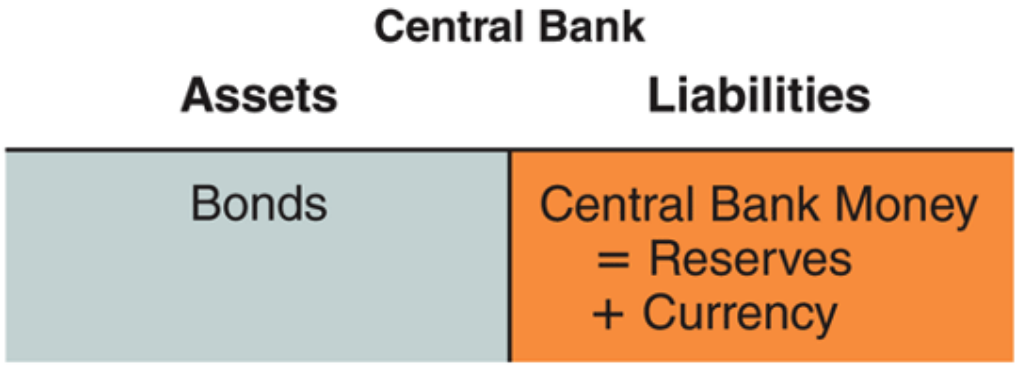
- Introduce banks as suppliers of money, revisits the determination of the interest rate and describe the role of the central bank in that context.

23 The Role of Financial Intermediaries

- **Financial intermediaries**: Institutions that receive funds from people and firms and use these funds to buy financial assets or to make loans to other people and firms.
- Banks are financial intermediaries that have money, in the form of **checkable deposits**, as their liabilities.
- Banks keep as **reserves** some of the funds they receive.
- The liabilities of the central bank are the money it has issued, called **central bank money**.

24 The Balance Sheet of Banks

25 The Balance Sheet of the Central Banks Revisited



Note: Since we introduce banks to the economy under consideration, we also need to introduce reserves to the balance sheet of the central bank. This complication is used to illustrate the idea of creation of money.

26 The Demand for Monetary Base

- Assume people hold no currency so the demand for money by people is the demand for checkable deposits:

$$M^d = \$YL(i) \qquad (2.3)$$
$$(-)$$

- The demand for reserves by banks depends on the amount of checkable deposits:

$$H^d = \theta M^d = \theta\,\$YL(i) \qquad (2.4)$$

  - θ is the **reserve ratio**, and H^d is demand for the monetary base.

Recap of HE1002 Lecture 7: Expansionary open market operation

- To increase money supply, the Fed engages in open-market purchase of government bonds
  - The Fed pays bond holders with new money
  - People who sell the bonds to the Fed deposit the proceeds in banks
  - Bank reserves increase
  - Kick start the process of lending and redeposit of funds
  - Money supply increases

Recap of HE1002 Lecture 7: Contractionary open market operation

- To reduce money supply, the Fed engages in open-market sale of government bonds
  - People who purchase the bonds from the Fed make payment with funds in their checking/saving accounts
  - The Fed retires these reserves from circulation
  - Bank reserves decrease
  - Kick start the process of decrease in lending and decrease in redeposit of funds
  - Money supply decreases

27 The Supply of Central Bank Money

- Let H denote the supply of central bank money ($H^s = H$), then the equilibrium condition:

$$H = H^d \qquad (2.5)$$

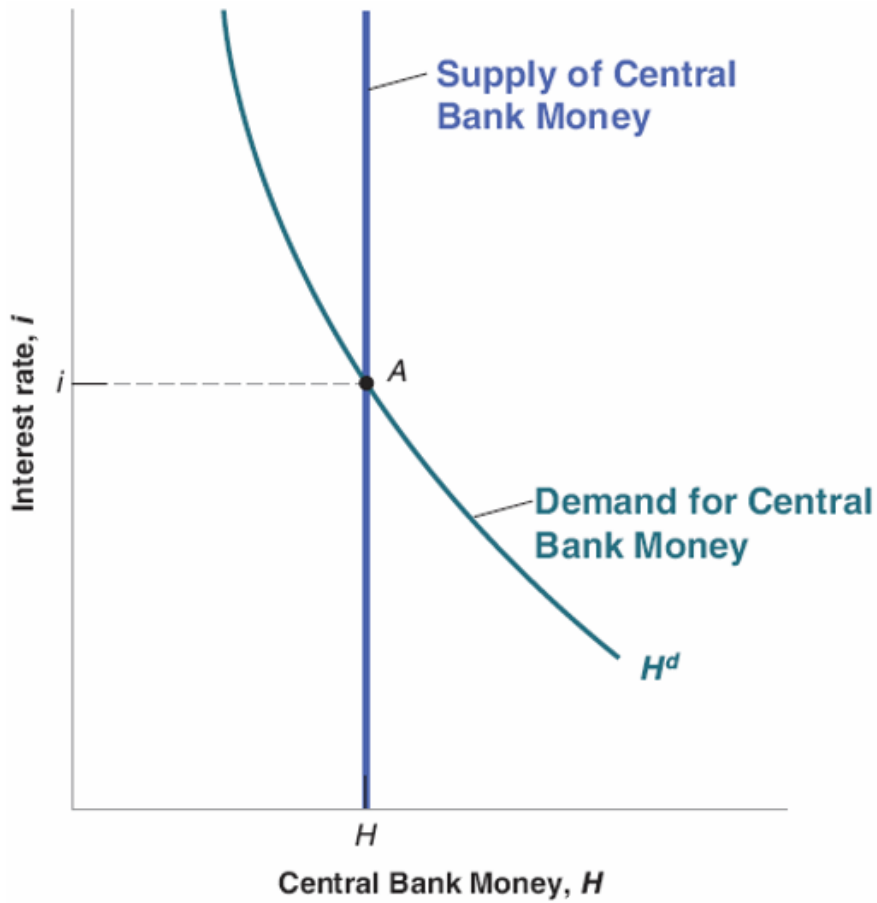
28 The Equilibrium in the Market for Central Bank Money

- In equilibrium, combine equation (2.4) and (2.5), $H^s = H^d \Rightarrow$

$$H = \theta \, \$YL(i) \qquad (2.6)$$

29 The Determination of the Interest Rate

- We can represent the equilibrium condition graphically.
- The equilibrium interest rate is such that the supply of central bank money is equal to the demand for central bank money.



30 The Money Multiplier

- The money multiplier is a concept in economics that represents the ratio of the broader money supply to the monetary base.
- It is used to estimate the total increase in the money supply resulting from a change in the monetary base.
- The money multiplier is calculated as 1 divided by the reserve requirement.
- Assume people hold no currency. If the ratio of reserves to deposits is 0.10, the money multiplier is 10.

31 The Effect of Central Bank Money Supply Changes

$$H = \theta \, \$YL(i)$$
$$(-)$$

- An increase in H leads to a decrease in the interest rate, and a decrease in H leads to an increase in the interest rate.

32 The Federal Funds Rate

- The **federal funds market** is an actual market for bank reserves.
- The **federal funds rate** is the interest rate determined in the federal funds market.
- The federal funds rate is the main indicator of U.S. monetary policy because the Fed can choose the federal funds rate it wants by changing H.

Sample Question 3 (vevox ID: 116-120-129)

We would expect which of the following to occur when the central bank pursues expansionary monetary policy?

- A) an increase in bond prices and an increase in the interest rate (i)
- B) a reduction in bond prices and an increase in i
- C) an increase in bond prices and a reduction in i
- D) a reduction in bond prices and a reduction in i
- E) none of these

33 Will Cryptocurrency Replace Dollars?

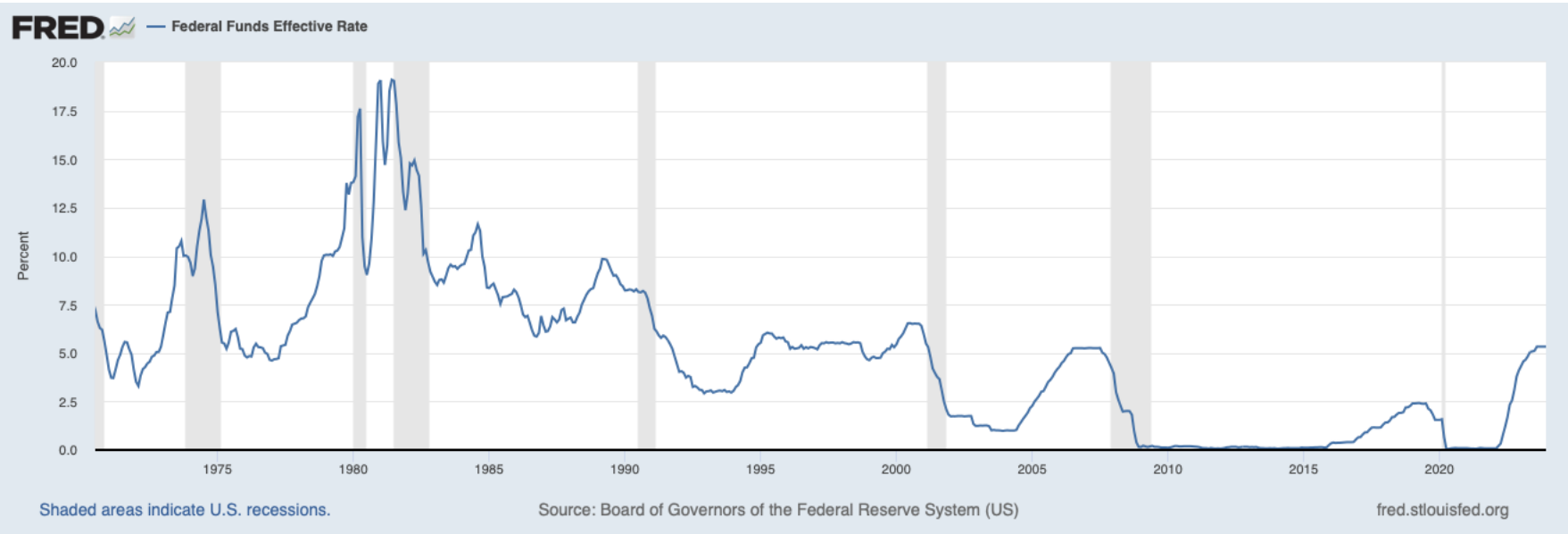
- Cryptocurrency is a type of virtual assets that can be used for transactions.
- As of January 2024 the total value of the global cryptocurrency in circulation is $1.7 trillion.
- Cryptocurrency is not likely to replace dollars for some reasons:
  - Most transactions are quoted in dollars, so price risk exists.
  - Governments do not want cryptocurrency to be the accepted currency since they want to control monetary policy.
- Remains to be seen

Cryptocurrency Prices Today By Market Cap

34 The Liquidity Trap

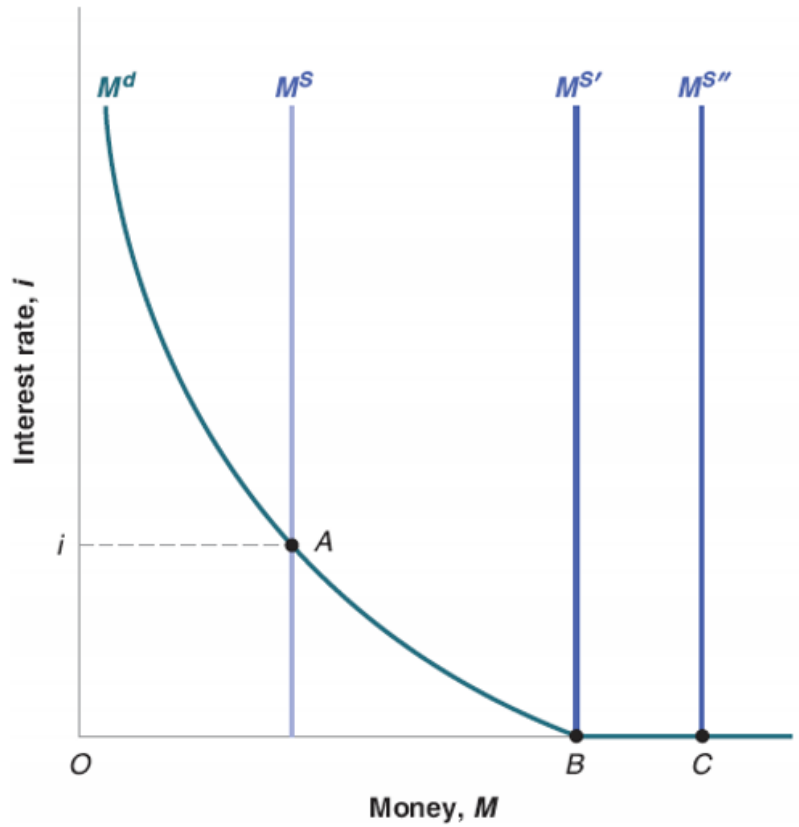
- **Zero lower bound**: The interest rate cannot go below zero.
- The economy is in a **liquidity trap** when the interest rate is down to zero, monetary policy cannot decrease it further.
    - The zero lower bound became a significant concern during the global financial crisis in the late 2000s.

35 U.S. Historical Federal Funds Rate



36 Money Demand, Money Supply, and Liquidity Trap

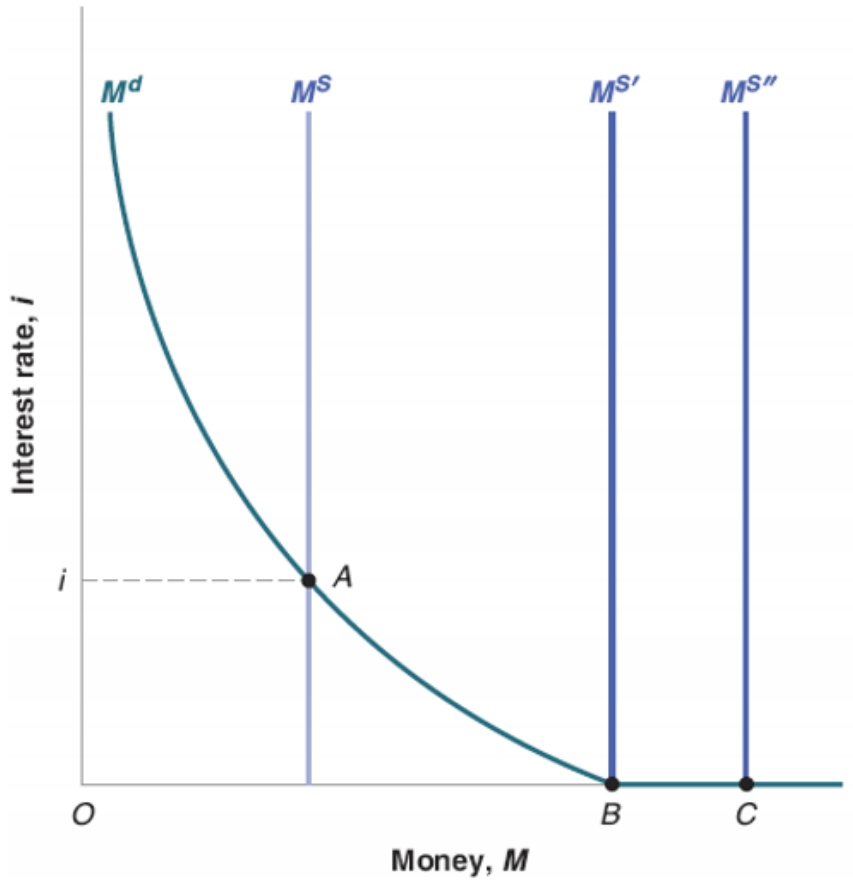
- When the interest rate is equal to zero, and once people have enough money for transaction purposes, they become indifferent between holding money and holding bonds.
- The demand for money becomes horizontal.



37 Money Demand, Money Supply, and Liquidity Trap

- This implies that, when the interest rate is equal to zero, further increases in the money supply have no effect on the interest rate, which remains equal to zero.

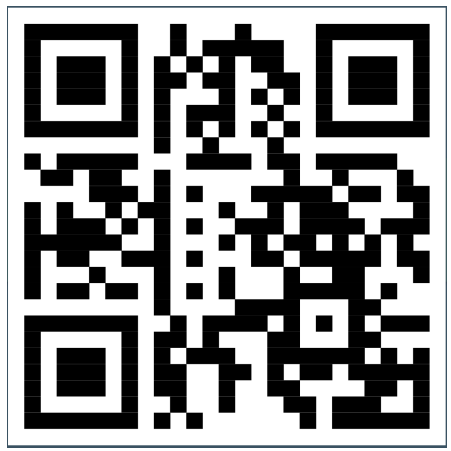
  (Increasing $M^{s'}$ to $M^{s''}$, equilibrium point moves from B to C)



Sample Question 4 (vevox ID: 116-120-129)

An open market purchase of bonds by the central bank will cause which of the following when a liquidity trap situation exists?

- A) The interest rate will decrease.
- B) The interest rate will not change.
- C) Output will increase.
- D) The money supply, M, will not change.
- E) none of these



38 Exit Ticket (vevox ID: 197-612-970)

- One idea you learned today that was surprising or interesting to you.
- Are there topics you wish had been covered in more detail, or questions you feel are unanswered?

- **Any questions?**

You can find me at guangzhi.ye@ntu.edu.sg or by scheduling an in-person meeting through https://calendly.com/guangzhiye24.