

# Lecture 4. The Financial Market

Reading: Blanchard, Chapter 4

# In the previous lecture...

- The Keynesian Cross:

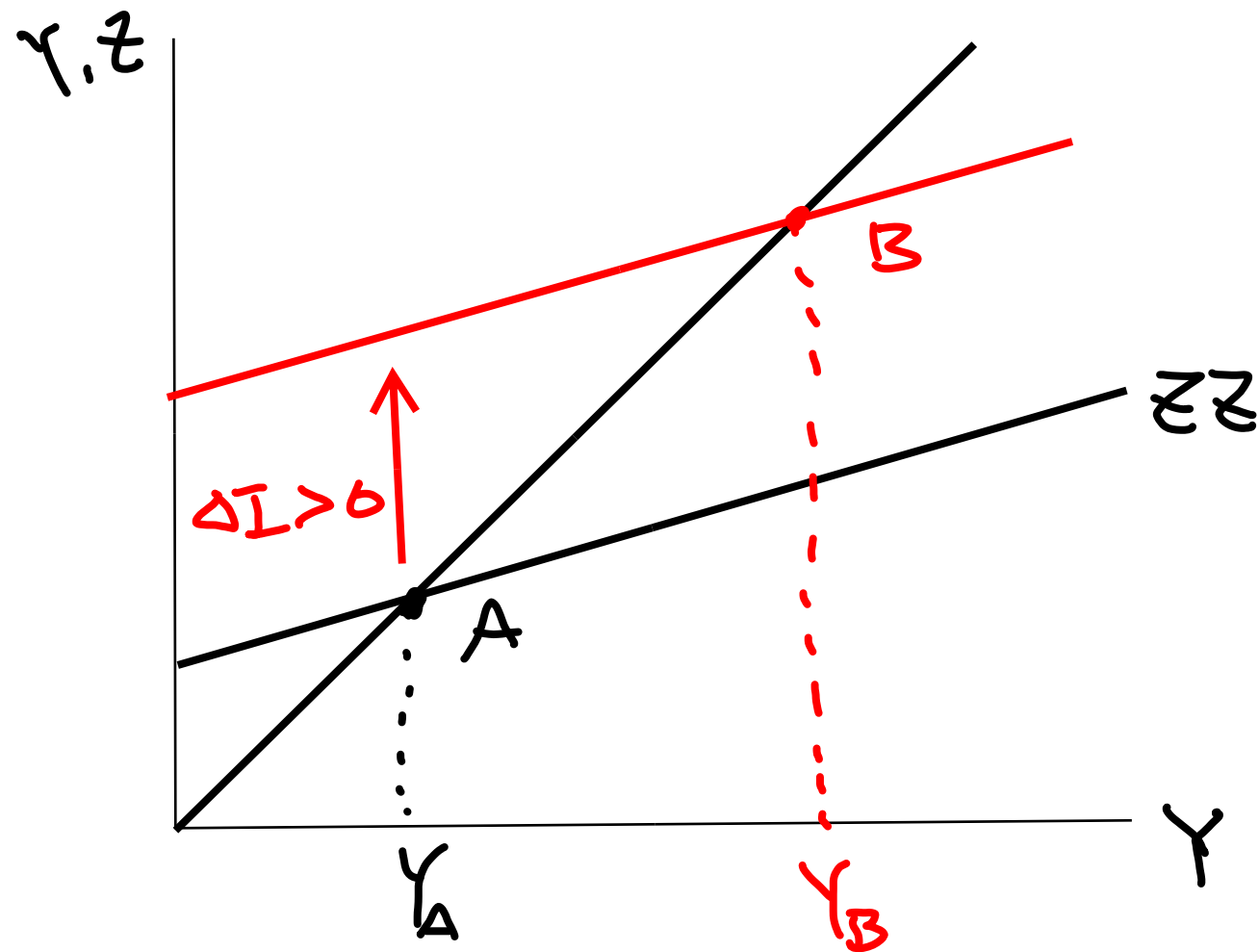
What is the equilibrium output given  $I$ ,  $T$ ,  $G$ ,  $c_0$ , and  $c_1$ ?

- What happens if either  $c_0$  or  $c_1$  changes?
- Basics of the government expenditure and taxes

# A Review: What happens if firms decide to invest more?

- Demand  $Z = c_0 + c_1(Y - T) + \bar{I} + G = (c_0 + \bar{I} + G - c_1T) + c_1Y$
- Supply  $Y = Y$
- If  $\bar{I}$  increases by  $\Delta I$ ...
- Remember that  $Y = \frac{1}{1-c_1} (c_0 + \bar{I} + G - c_1T)$ . As a result,
$$\Delta Y = \frac{1}{1-c_1} \Delta I.$$

# Graphical illustration



# Outline

- Money Supply and Open Market Operations
- Money Demand
- The Equilibrium Interest Rate
- The Liquidity Trap

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# Goals

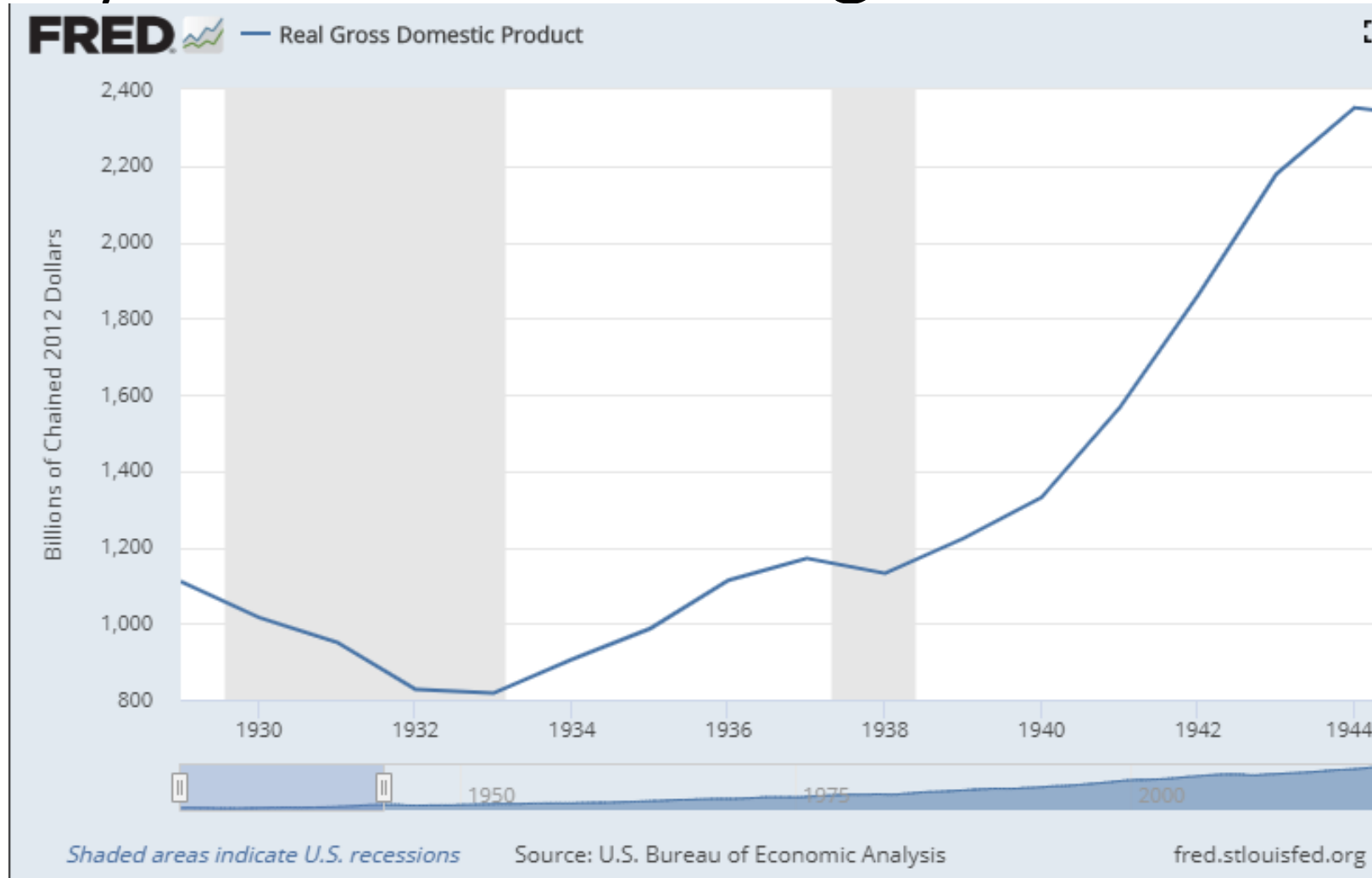
- To introduce money, bond, and the (nominal) interest rate.
- To understand how the central bank can adjust the supply of money to determine the interest rate.
- Which factors determine the demand for money?
- To illustrate the liquidity trap and the zero-lower bound.

# What is money?

- Liquidity: A financial asset is liquid if it can be quickly used to buy goods and services.
- : Legal tender notes and coins + Checkable deposits
  - Most liquid assets that can be used directly in transactions.
- : + Some less liquid assets

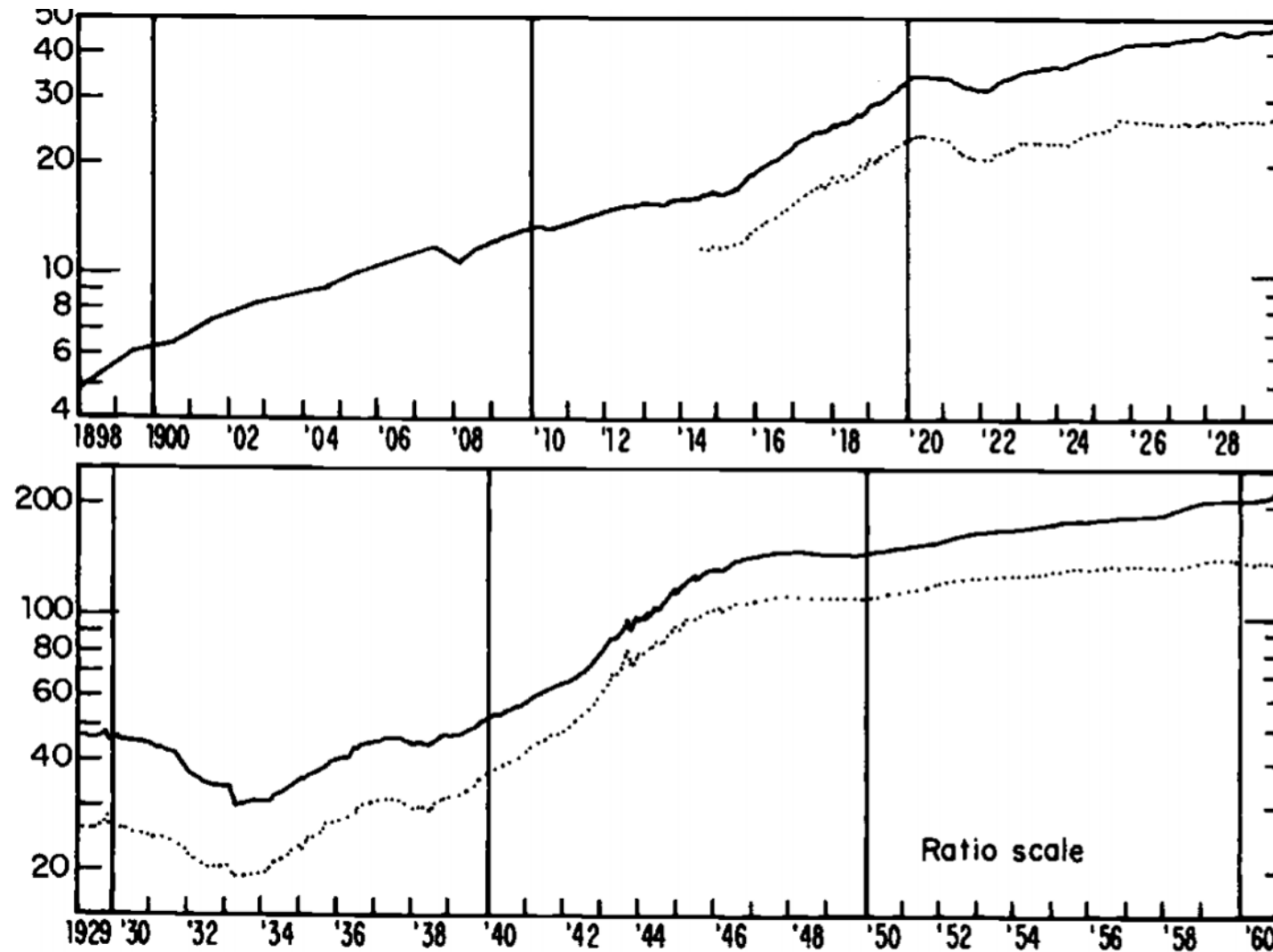


# Does money matter? Revisiting the Great Depression



- RGDP from 1929 to 1933: 1,109 → 817.
- In 4 years, roughly 30% of RGDP were lost.

# The Great Contraction



**Figure 2.1** Money stock including commercial bank time deposits, 1867--

- Friedman, M. and A. J. Schwartz (1987), Money and Business Cycles.

- ‘Let me end my talk by abusing slightly my status as an official representative of the Federal Reserve System. I would like to say to Milton and Anna: Regarding the Great Depression. You’re right, we did it. We’re very sorry. But thanks to you, we won’t do it again.” – Governor Ben Bernanke, November 8, 2002.
- We will study what happens when money supply changes. We will also see why a decrease in money supply may induce a recession.

# Open Market Operations and $M^S$

- Central banks typically change the supply of money,  $M^S$ , by buying or selling government bonds in the bond market, open to everyone.
- Expansionary Monetary Policy / Open Market Operation:
- Contractionary Monetary Policy / Open Market Operation

# Outline

- Money Supply and Open Market Operations
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- The Liquidity Trap

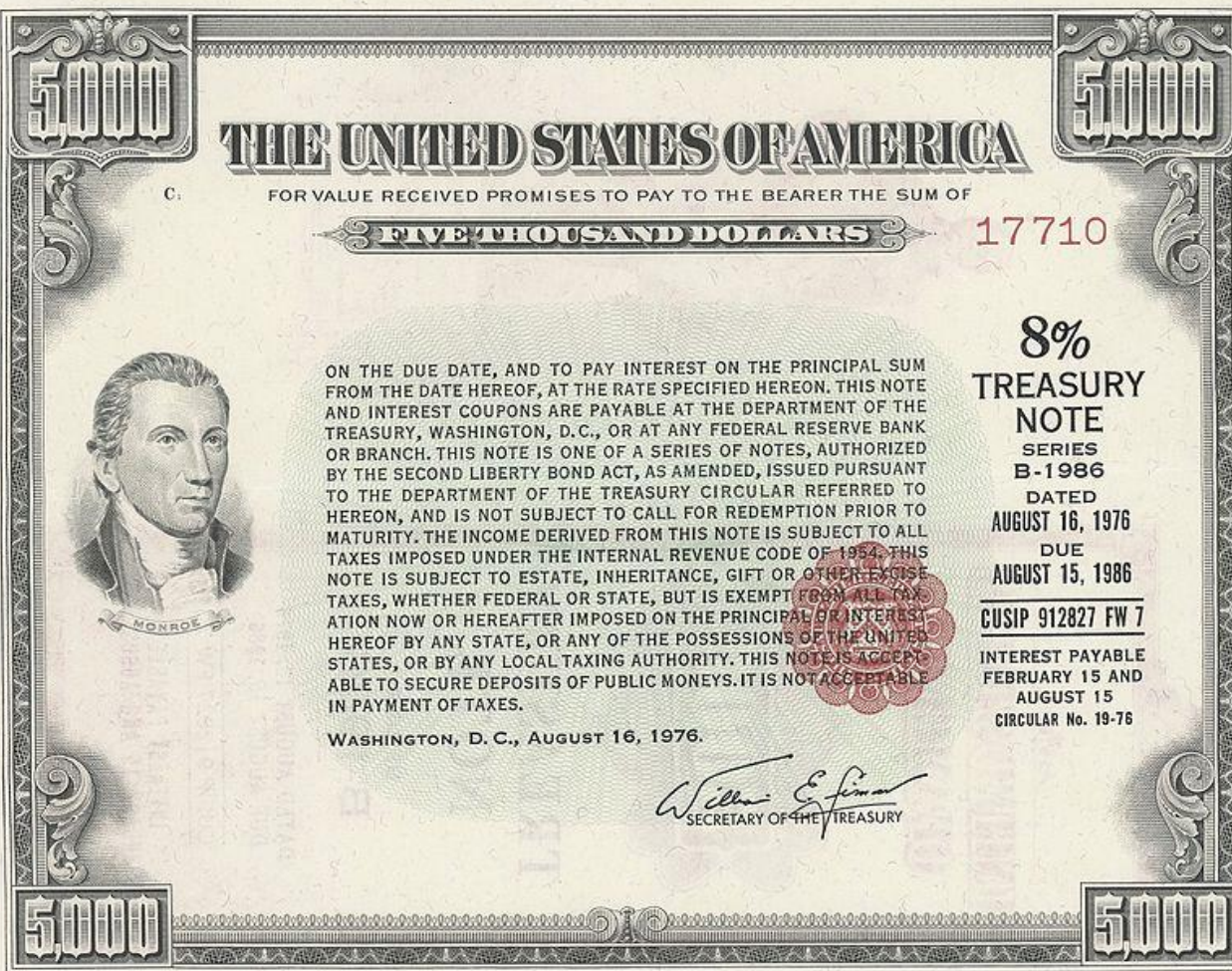
# Money vs. Other financial assets (including bonds)

- Given your financial wealth, you need to determine how much money to hold and how much to invest in other assets.
- Why do people hold money?
- Why do people hold other assets?
- Idea) Money Demand  $M^D = f(\text{transaction, interest rates})$

# Assume: the interest rate

- There are many different types of financial assets in the real world.  
ex) Stocks, Gov. bonds, Corporate bonds, Derivatives, etc.
- We focus on one-year zero-coupon risk-free government bonds.
- So, there is only one financial asset other than money. Its interest rate is denoted by  $r$ .





# Treasury bonds

- An example
- 10-year coupon bond
- Face value / coupon rate
- Cash flow:



- Source:  
[https://en.wikipedia.org/wiki/United\\_States\\_Treasury\\_security#/media/File:1976\\_\\$5000\\_8%\\_Treasury\\_Note.jpg](https://en.wikipedia.org/wiki/United_States_Treasury_security#/media/File:1976_$5000_8%_Treasury_Note.jpg)



# One-year zero-coupon bond

- Consider a one-year zero-coupon Treasury (= risk-free) bond with  
A face value of \$100 and the price today, denoted by  $P_B$ .
- Invest  $P_B$  today  $\rightarrow$  \$100 in one-year
- Rate of return on holding this bond for a year:  $i =$
- Ex)  $P_B = 99 \rightarrow i =$
- What is the rate of return on holding money?

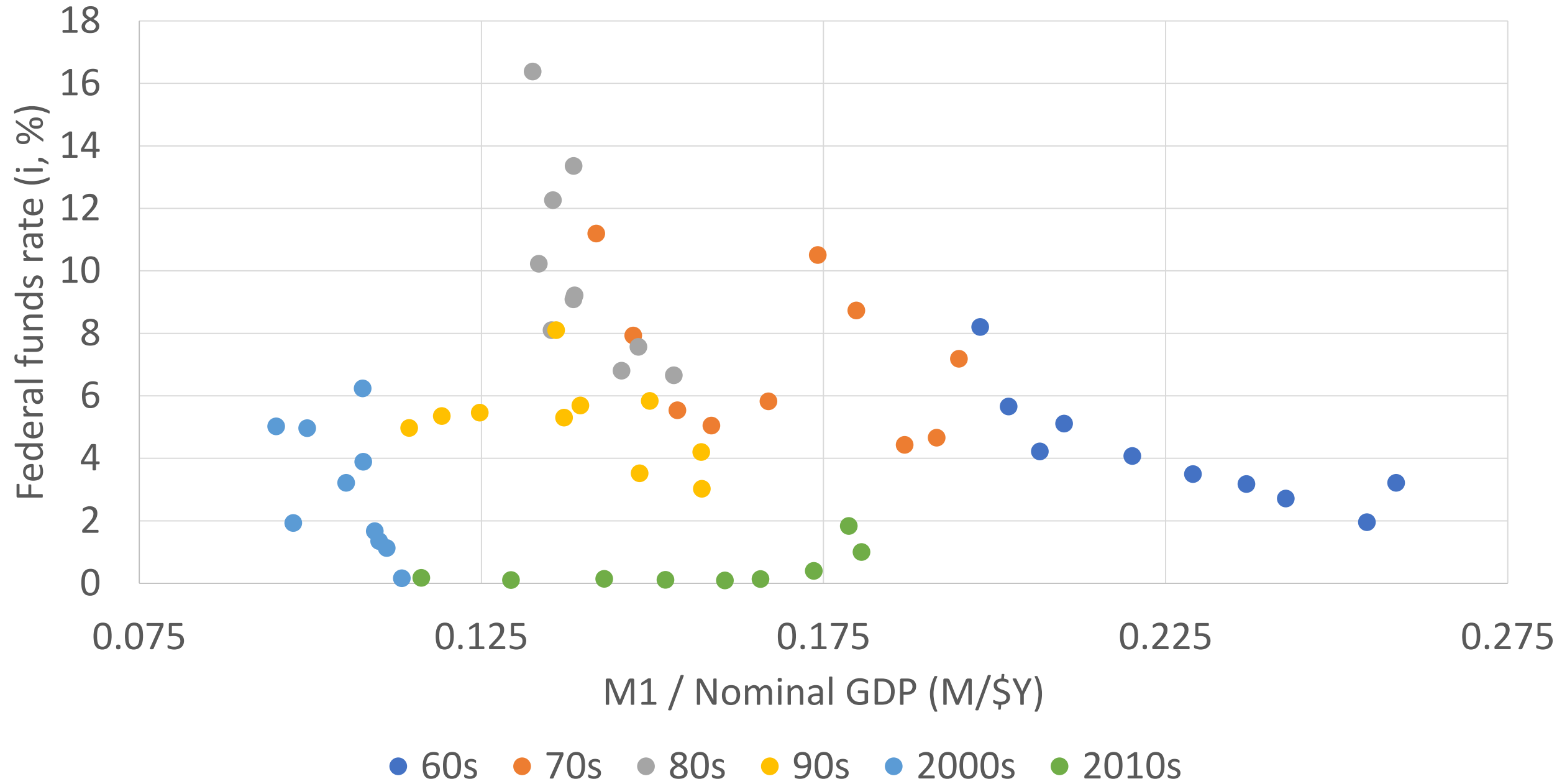
$$i = \frac{\$100 - \$P_B}{\$P_B} \Leftrightarrow \$P_B = \frac{\$100}{1 + i}$$

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

# Money demand $M^D$

- Why do people hold money?  
For liquidity. For transaction purposes.
- Why do people hold bonds?  
Positive interest rate  $i$ .
- We ASSUME that

i vs M/\$Y in the US



## $i$ and $M/\$Y$

- In the short/medium-run, there is a clear negative relationship between  $i$  and  $M/\$Y$ .
- $M/\$Y$  has decreased over time. In the graph, the dots are shifting to the left.

# Quantity theory of money

- $MV = \$Y$

- $V$ :

To complete the total transaction of final goods and services, which amounts to  $\$Y$ , how many time (i.e. how fast) money should travel across people.

- The velocity of money ( $\$Y/M$ ) has increased over time due to technological development (e.g. ATM, credit card, etc.). That is, people carry less money (= demand less money) now.

# Outline

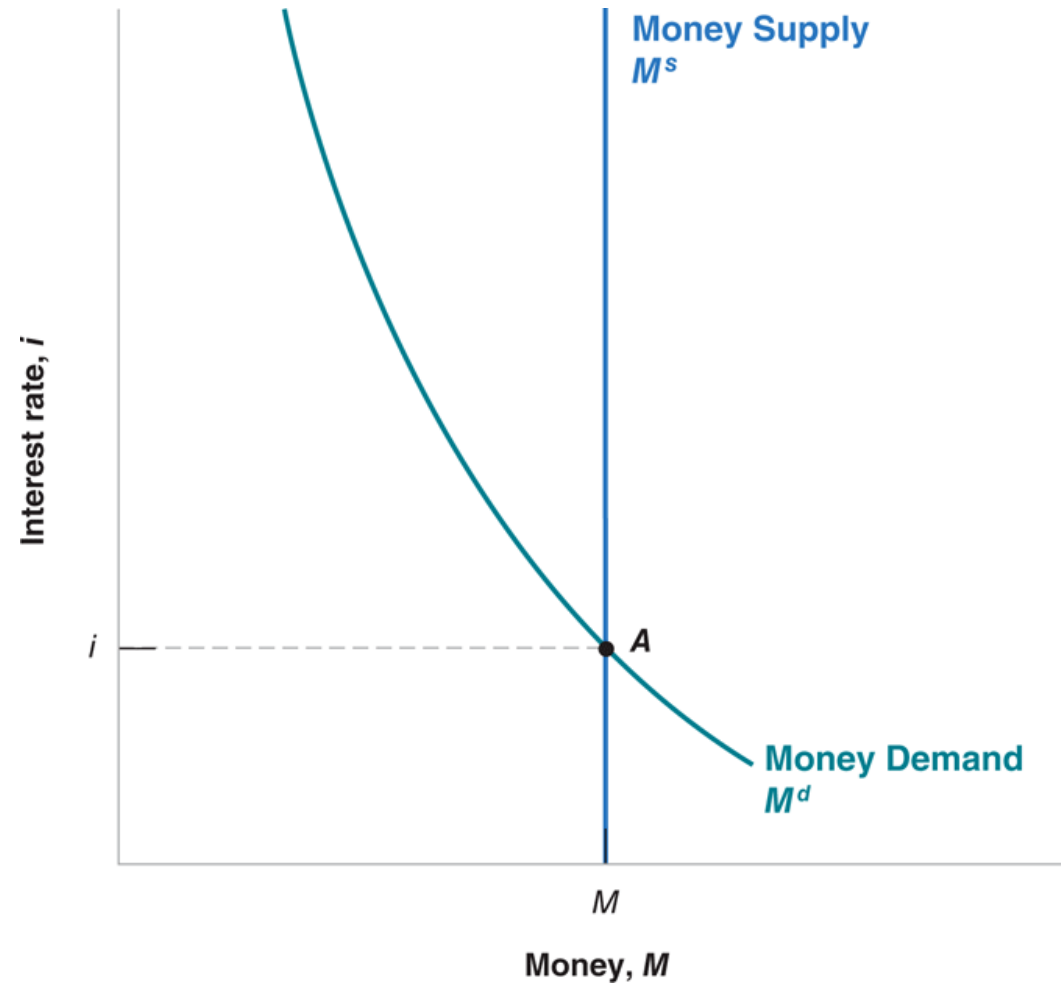
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# Supply and Demand for Money

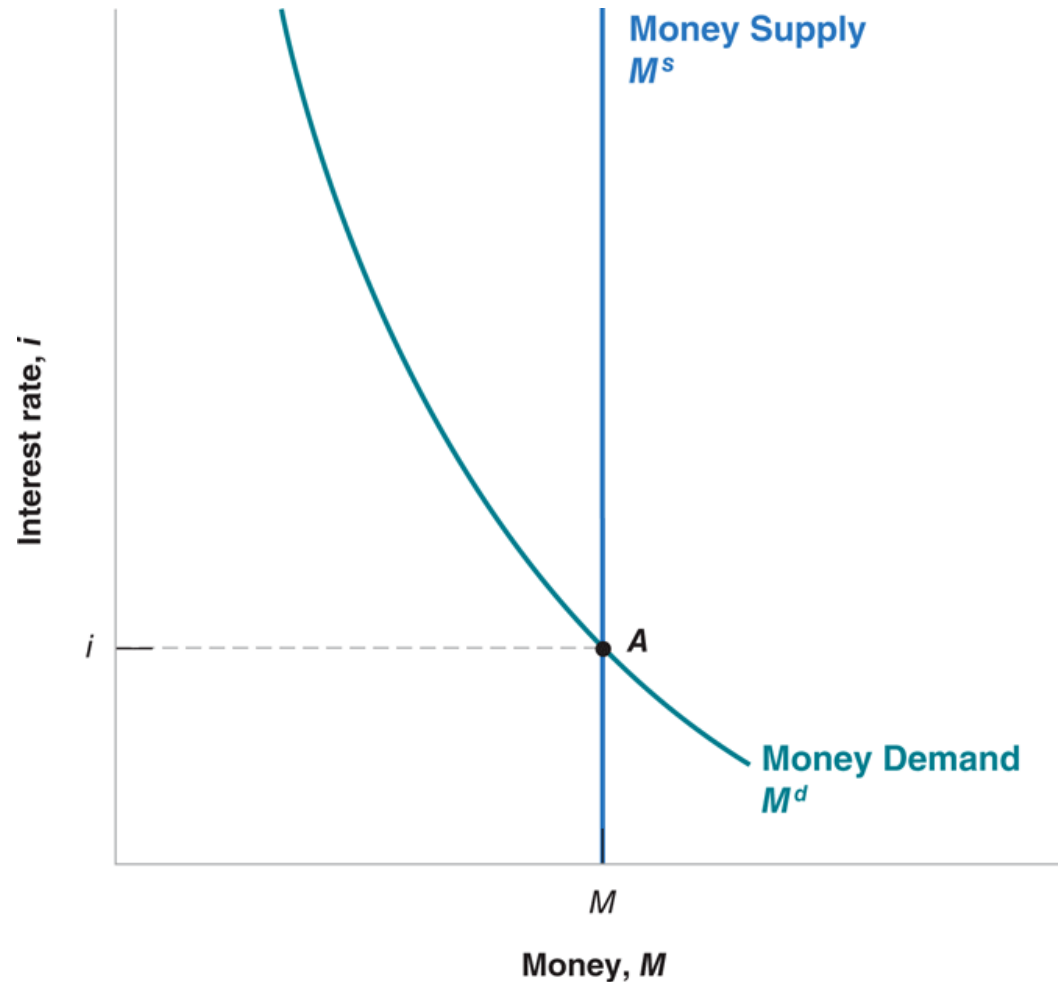
- $M^S$ : Determined by the central bank. Adjusted via
  - $M^D$ : Liquidity for transactions (money) vs. interest rate (bond)
- 
- Equilibrium condition:



# Equilibrium interest rate



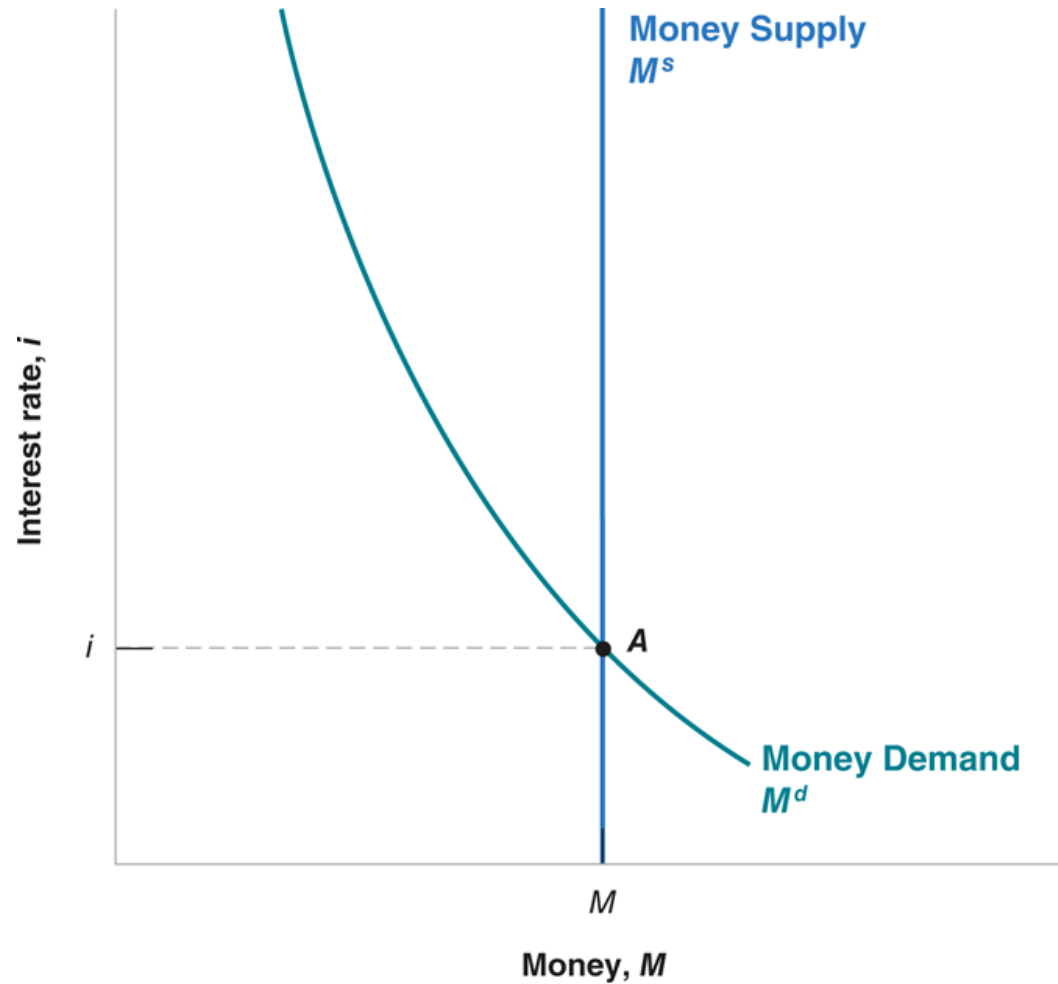
What if the central bank increases  $M^S$ ?



# Meanwhile, in the bond market...

- Expansionary MP case
- CB buys bonds in the open market.
  - Demand for the bond
  - Price of the bond
  - $\Leftrightarrow i$
- Is this consistent with the result in the money market?
- Exercise) Think about a contractionary MP by your self.

# What if $Y$ increases?



# Meanwhile, in the bond market...

- $\$Y \uparrow$ : People need more money for transactions.
  - People demand more money.
  - Demand for the bond
  - Price of the bond
  - $\Leftrightarrow i$
- Is this consistent with the result in the money market?

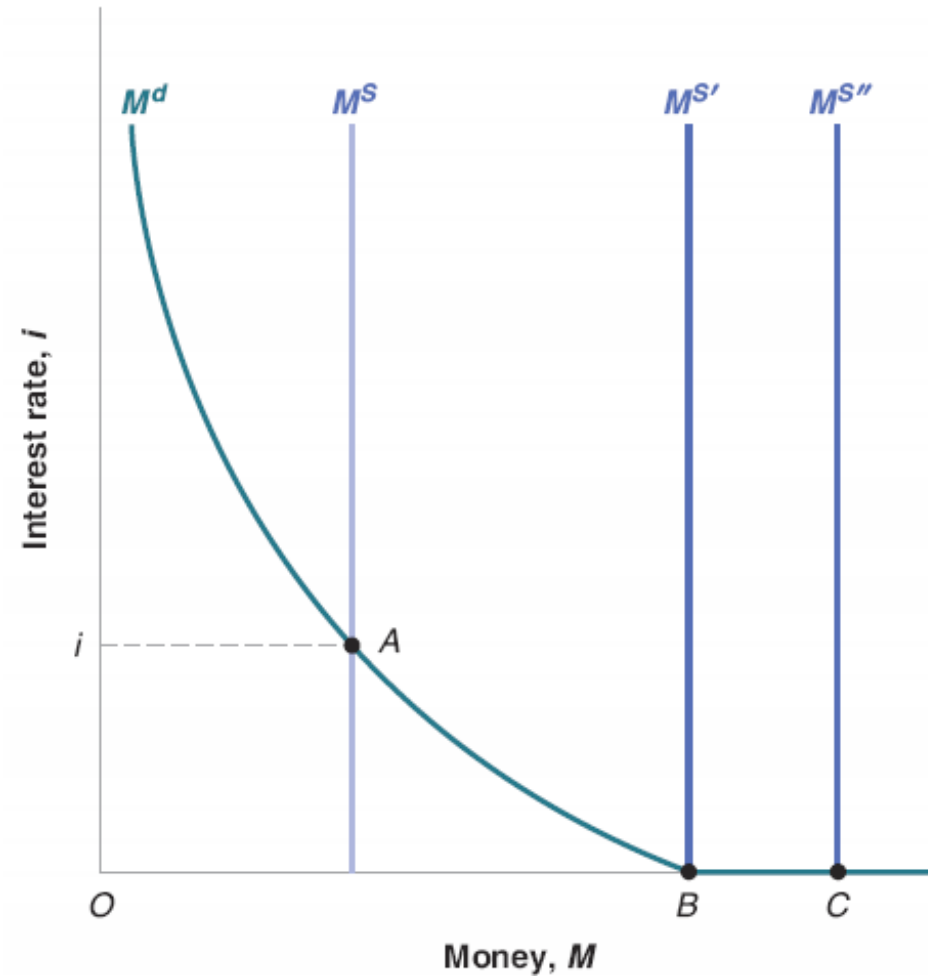
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# The Liquidity Trap and the Zero Lower Bound

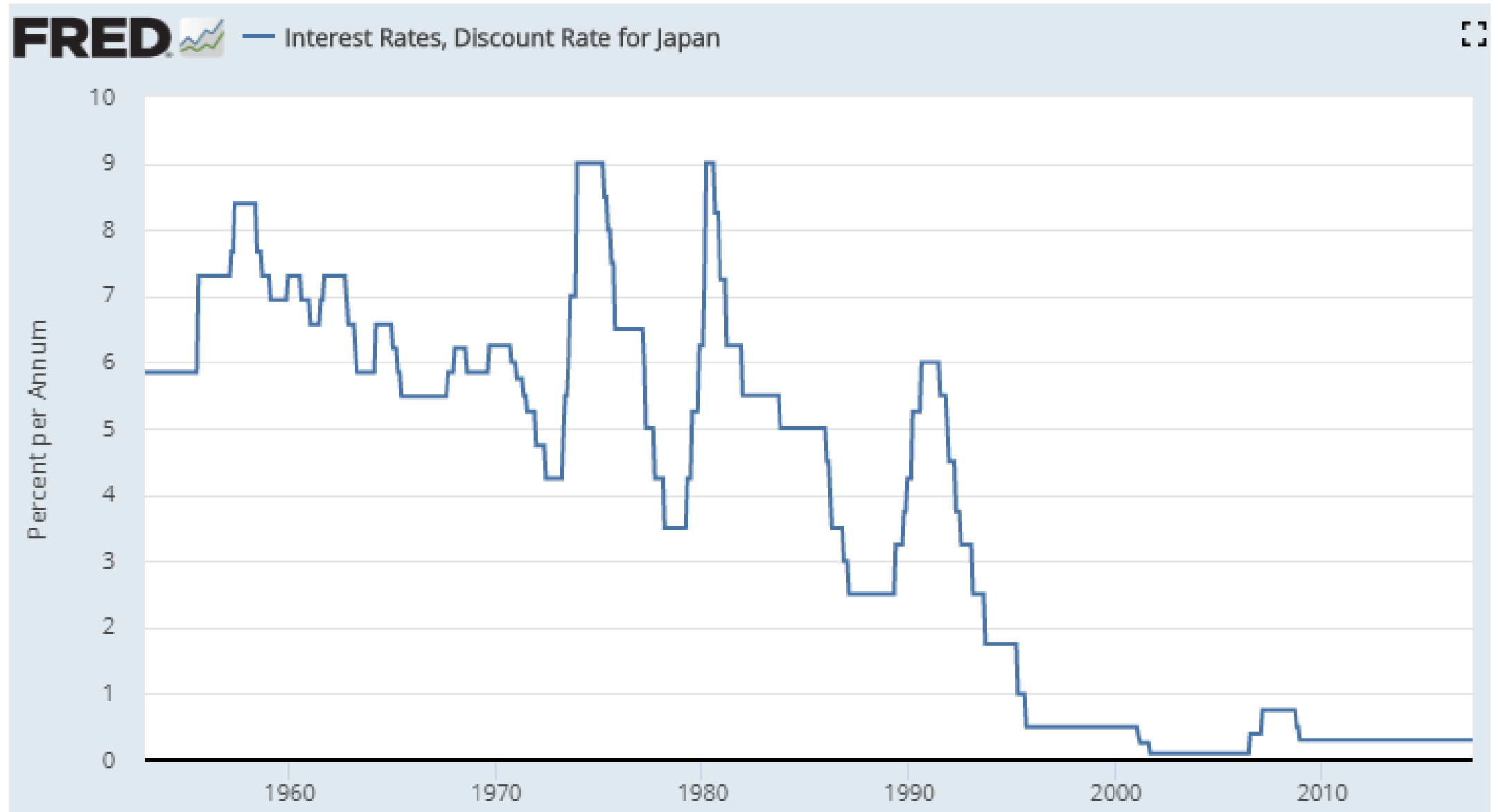
- If  $i < 0$ , bonds, which are less liquid than money, become strictly dominated by money.
- When  $i = 0$ , beyond the amount needed for transaction purposes, people feel indifferent between money and bond.
- So, the central bank cannot reduce the interest rate below zero through open market operations. That is, there is the zero lower bound.

# The Liquidity Trap and the Zero Lower Bound

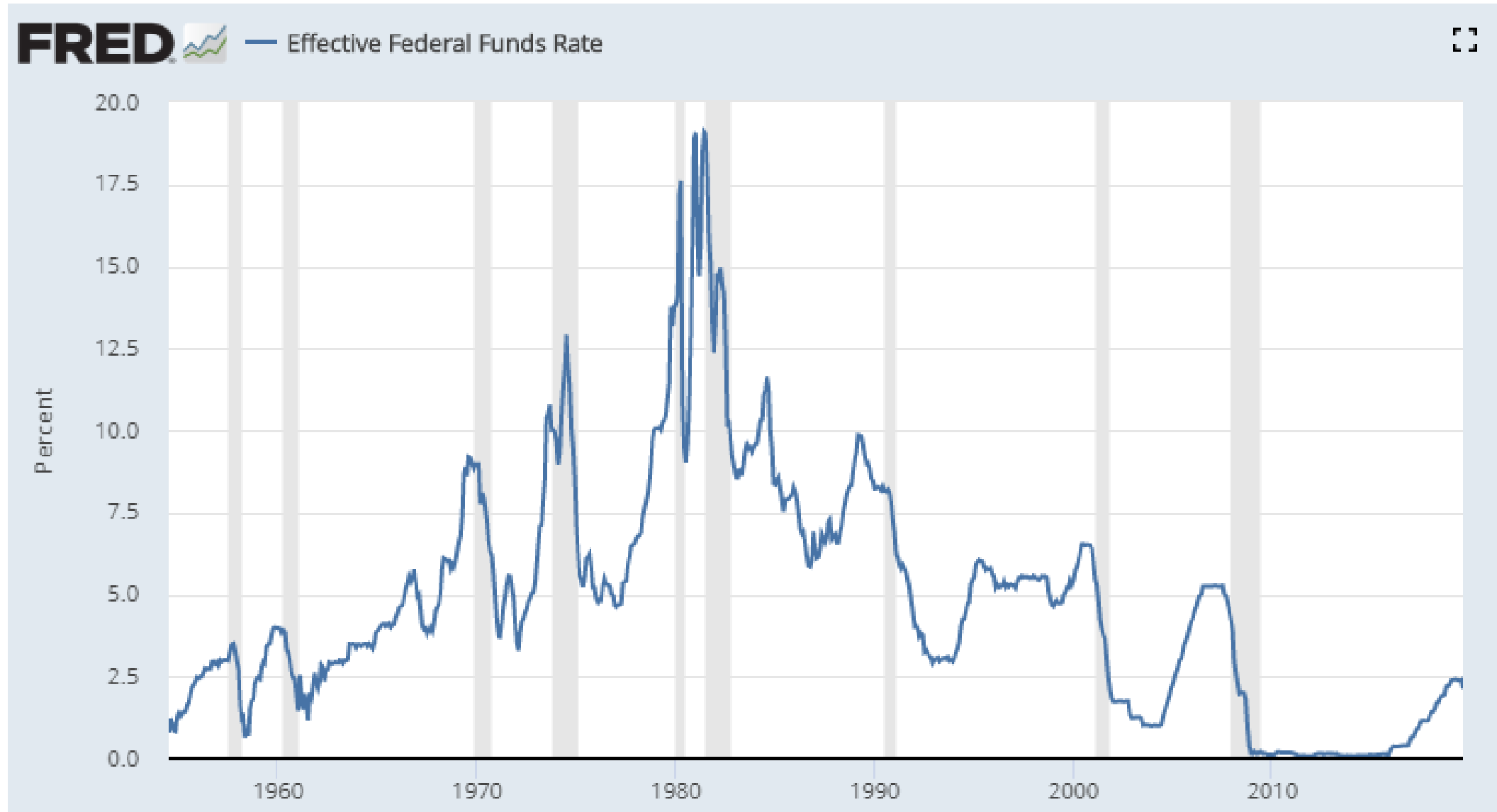




# Does the ZLB matter?



# Does the ZLB matter?



# Summary

- $i$  is determined by the equality of  $M^S$  and  $M^D$ .
- By changing \_\_\_\_\_, the CB can affect  $i$ .
- The CB changes  $M^S$  through \_\_\_\_\_
- Thus, the CB can choose  $i$  by changing  $M^S$  as long as  $i \geq 0$ .
- “In light of the implications of global developments for the economic outlook as well as muted inflation pressures, the Committee decided to lower the target range for the federal funds rate to 2 to 2-1/4 percent.”-FOMC Statement, July 31, 2019
- <https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm>

# In the next class...

- We incorporate the interest rate to the Keynesian cross and develop the IS-LM model.
- This framework is useful when we think about  $Y$ ,  $C$ ,  $I$ ,  $i$ ,  $G$ ,  $T$ , and  $M$  in the short-run.
- Blanchard, Chapter 5.