

# Money, Banking, the Fed, and Monetary Policy

Umesh Ghimire

BSC

May 3, 2022

# Context

- ① Monetary policy is another useful tool to help economic growth and to minimize the extent of economic fluctuations
- ② In this chapter, we will learn about what the technical concept of money is, what roles it plays and why it is important
- ③ Then we will look at how do the actions of private banks and the Federal Reserve determine the money supply
- ④ We will also learn a bit about the Federal Reserve System

# What is money ?



How much money does Bill Gates have?

# What is money ?

- Normally, we refer to total wealth as money.
- But economists' definition of money does not include all forms of wealth—cars, houses, stocks are NOT money.

Then what is money in economics?

# What is money ?

- In economics, money includes any asset that can be converted into cash quickly—in other words, money includes liquid assets.

Ask yourself: can you convert your car to cash quickly enough to pay for your Caramel Iced Coffee at Dunkin? If no, that asset isn't part of money in economics. If yes, it is.

- Is your bank account included in money even though you haven't converted it into cash?

# What is money ?

Economists usually use two definitions of money depending on which assets are included: Narrow and Broad.

- **Narrow definition of money** considers only the most liquid assets such as currency in circulation, checkable bank deposits, and traveller's check.
- **Broad definition of money** includes the assets included in the narrow definition *plus* assets that are “almost” checkable such as savings account deposits that can be easily transferred to checking account.

# Why is money important ?

Imagine a barter system where you can only exchange goods or services with one another.

- How easy would it be for an investment banker to buy an iPhone in a barter system?
- Trade would be possible only if Apple CEO wanted investing advice and the banker wanted an iPhone in exchange. This is called a *double coincidence of wants*.
- Money plays a *crucial role in generating gains from trade*. That's why it is so important!

# What roles does money play?

Having realized that money is so important, let's summarize what roles it plays

- **Medium of exchange:** money is an asset that individuals acquire for the purpose of trading rather than for their own consumption. It is something people accept as payment for goods and services.
- **Store of value:** you can save money. Imagine in the barter system how you could save a cow for 30 years! By saving money, you can “store” purchasing power for future so that you can buy goods and services in future.
- **Unit of accounts:** money provides a yardstick for measuring and comparing the values of a wide variety of goods and services. Imagine paying rent in the form of labor and goods (and not money) as in the Middle Ages.



# Types of money

- **Commodity money:** a good used as a medium of exchange that has intrinsic value in other uses. Example: gold and silver coins.
- **Commodity-backed money:** a medium of exchange with no intrinsic value; the ultimate value is guaranteed by a promise that it can be converted into valuable goods. Usually backed by gold and silver.
- **Fiat Money:** This is the modern money. It isn't backed by any commodity. Its value derives entirely from its official status as a means of payment (just because people trust it!). *“Fiat” means a binding order or a rule by a ruler or a court.*

# Money Supply

# Measuring Money Supply

Money supply is the total value of financial assets in the economy that are considered money. We look at two monetary aggregates to measure money supply:  $M1$  and  $M2$ .

## 1 $M1$

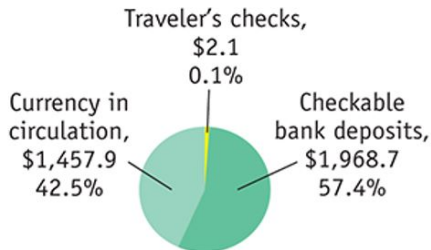
- ▶ includes only the most liquid forms of money such as currency in circulation, checkable bank deposits and traveler's checks.

## 2 $M2$

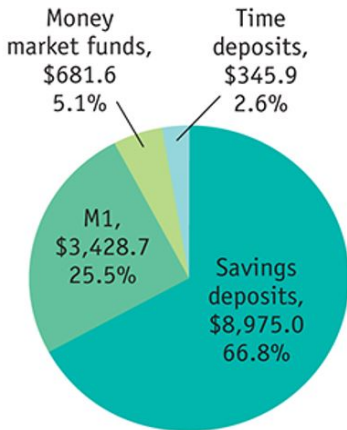
- ▶ Includes  $M1$  plus other near-moneys such as saving account deposits, time deposits (such as small denomination certificate of deposits). These additional financial assets can be easily converted to cash even though they are not directly used to buy goods and services.

# M1 and M2 in the US

(a) M1 = \$3,428.7  
(billions of dollars)



(b) M2 = \$13,431.3  
(billions of dollars)



# Monetary role of banks

**Question:** Less than a half of  $M1$  is currency; where does the rest of the money supply come from?

**Answer:** Bank deposits make up more than a half of  $M1$  and most of  $M2$ .

**Moral of the story:** Banks are important in determining money supply.

**Let's find out why and how**

# Monetary role of banks: **the T - Accounts**

Let's use *T - Accounts* to understand why and how.

Balance Sheet of a hypothetical bank

**FIGURE 14-3 Assets and Liabilities of First Street Bank**

First Street Bank's assets consist of \$1,200,000 in loans and \$100,000 in reserves. Its liabilities consist of \$1,000,000 in deposits—money owed to people who have placed funds in First Street's hands.

Assets		Liabilities	
Loans	\$1,200,000	Deposits	\$1,000,000
Reserves	\$100,000		

# Monetary role of banks

## A few terminologies to keep in mind

- **Reserves** includes the currency in the bank vault and bank deposits in the bank's own accounts at the Federal Reserve.
- **Reserve Ratio** ( $rr$ ): the fraction of deposits the bank has to hold as reserve.
  - ▶ In our example, it is  $\frac{\$100,000}{\$1,000,000} = 0.1$  or 10%.
- In the US, the Fed sets a minimum reserve ratio to reduce the risk of bank runs.

# How banks create money

- We already know that **banks are financial intermediaries** that use liquid assets (in the form of bank deposits) to finance the illiquid investments of borrowers.
- By accepting deposits and making loans, banks and other financial institutions are also able to create money.
- When you deposit money in a bank account, the bank is required to hold a part of it in its vault as cash (or else in an account with the regional Federal Reserve Bank). We already know this is called reserve ratio.



# How banks create money: magic of fractional reserve system

Imagine a customer deposits \$1,000 in her bank account. Let's analyze how much money banks can create out of this new \$1,000 deposit. We'll use the *T – Accounts* as a tool of our analysis.

Assume reserve ratio ( $rr$ ) = 10%.

(a) Initial Effect Before Bank Makes a New Loan

Assets		Liabilities	
Loans	No change	Checkable deposits	+\$1,000
Reserves	+\$1,000		

(b) Effect When Bank Makes a New Loan

Assets		Liabilities	
Loans	+\$900	No change	
Reserves	-\$900		

# How banks create money: magic of fractional reserve system

The first bank lends \$900 to another customer who pays the money to another one who deposits it at her bank—and the cycle starts all over. Sounds familiar?

How banks create money

	Currency in circulation	Checkable bank deposits	Money supply
<b>First stage</b> Silas keeps his cash under his bed.	\$1,000	\$0	\$1,000
<b>Second stage</b> Silas deposits cash in First Street Bank, which lends out \$900 to Maya, who then pays it to Anne Acme.	900	1,000	1,900
<b>Third stage</b> Anne Acme deposits \$900 in Second Street Bank, which lends out \$810 to another borrower.	810	1,900	2,710

## Time for some practice!

**Question 1:** Given this T-account and assuming the bank holds no excess reserves, what is the required reserve ratio here?

Assets		Liabilities	
Required reserves	\$100	Deposits	\$1,000
Loans	\$400		
Treasury bills	\$800		

# The Federal Reserve System (The Fed)

# The Fed

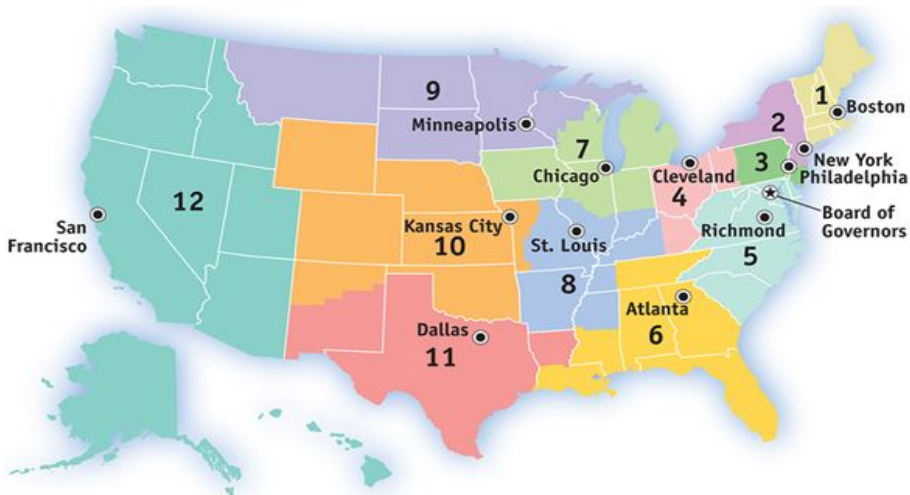
- Most countries have a central bank. In the US, The Federal Reserve is the central bank; it oversees and regulates the banking system and controls money supply in the US.
- Its head is called the Fed Chair. Currently, the Fed Chair is Jerome Powell.



# The Fed: Structure

- The Fed was created in 1913. It is not exactly a government entity, neither it is a completely private institute.
- The Fed consists of two parts: the Board of Governors and the 12 regional Federal Reserve banks
  - ▶ The Board of Governors acts like a government agency: its 7 members are appointed by the president and must be approved by the senate. They have 14 year term.
  - ▶ The Chair is appointed every 4 years, but many serve more than that (Janet Yellen served only for four years)

# Where are the Fed regional offices?



Alaska and Hawaii are part of the San Francisco District

# How does the Fed conduct monetary policy?

The Fed has three monetary policy tools:

- 1 Reserve requirements
- 2 The discount rate
- 3 Open-market operations

Open-market operations is the most important policy tool.

**Remember: The Fed conducts Monetary Policy. It has NOTHING TO DO WITH FISCAL POLICY.**



# The federal funds rate

We learned that banks must maintain a certain fraction of their deposits as reserves.

What does a bank do if it can't meet the Fed's reserve requirement?

- The federal funds market allows banks that fall short of the reserve requirement to borrow funds from banks with excess reserves.
- Borrow at what interest rate?
  - ▶ **The federal funds rate**, the rate determined at the federal funds market via demand and supply (most of the times).
  - ▶ Federal funds rate is not always determined by demand and supply. The Fed intervenes in the market from time to time to influence this rate. That's what we mean by "the Fed changed the interest rate."

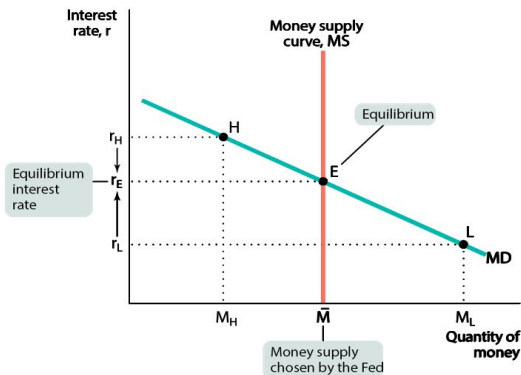
# The discount rate

What if a bank cannot find funds in the federal funds market?

- It then goes to its bank, the Fed, to borrow funds.
- But borrowing from the Fed is more expensive than borrowing from the federal funds market! How expensive?
  - ▶ Banks can borrow from the Fed at an interest rate 1 percentage point higher than the federal funds rate
  - ▶ This rate the Fed charges on loan to banks is called the **discount rate**.

# Open Market Operations (OMO)

- Money demand curve slopes downward because people want to hold less cash if interest rate is higher.
- Money supply curve is fixed at a given point in time by the Fed, so it's a vertical line.
- Through OMO, the Fed can change the money supply curve and thus affect the federal funds rate



# Open Market Operations (OMO)

Since the Fed is a bank itself, it has a balance sheet. Let's summarize its assets and liabilities in a *T – Account*.

**FIGURE 14-7 The Federal Reserve's Assets and Liabilities**

The Federal Reserve holds its assets mostly in short-term government bonds called U.S. Treasury bills. Its liabilities are the monetary base—currency in circulation plus bank reserves.

Assets	Liabilities
Government debt (Treasury bills)	Monetary base (currency in circulation + bank reserves)

# Open Market Operations (OMO)

- The Fed conducts OMO to change money supply.
- It can change money supply by affecting the **Monetary base**
  - ▶ **Reminder: Monetary base = currency in circulation + bank reserves**
- OMO directly affects the “bank reserves” part of monetary base. How?
  - ▶ In an OMO, Fed buys or sells the U.S. Treasury bills (aka T-Bills), normally through a transaction with *commercial banks*, and *investment banks*.
- **The Fed never buys Treasury bills directly from government.**  
Why?
  - ▶ recipe for disastrously high inflation!
  - ▶ this also helps to make sure that the Fed’s decisions are independent of the government.

# Open Market Operations (OMO)

- When the Fed **buys** any asset (including the T-Bills), **bank reserves increase**.
- Because government bonds can be stored indefinitely and are easy to buy and sell on the open market, the Fed chooses them to buy and sell daily.
  - ▶ The Fed can buy and sell billions of dollars' worth of government bonds in minutes.
- The Fed usually buys and sells short-term bonds called Treasury bills, or T-bills.

## OMO: how does it look like?

Monetary policy objective: Increase money supply

OMO action: the Fed **PURCHASES** T-bills from commercial banks

### (a) An Open-Market Purchase of \$100 Million

	Assets		Liabilities	
<b>Federal Reserve</b>	Treasury bills	+\$100 million	Monetary base	+\$100 million
<b>Commercial banks</b>	Assets		Liabilities	
	Treasury bills	-\$100 million	No change	
	Reserves	+\$100 million		

## OMO: how does it look like?

Monetary policy objective: Reduce money supply

OMO action: the Fed SELLS T-bills to the commercial banks

### (b) An Open-Market Sale of \$100 Million

	Assets		Liabilities	
Federal Reserve	Treasury bills	-\$100 million	Monetary base	-\$100 million

	Assets		Liabilities
Commercial banks	Treasury bills	+\$100 million	No change
	Reserves	-\$100 million	



# OMO: how does it affect money supply?

OMO affects money supply because it directly affects banks' excess reserves, which is what banks use to create money.

- If the Fed wants to **INCREASE** the money supply, it will **BUY T-bills**:
  - ▶ to pay for the T-bills, Fed electronically increases the reserves of the seller
  - ▶ with more reserves, banks increase loans
  - ▶ money supply increases as the loans/money creation process ripples through the economy (money multiplier working forward)

# OMO: how does it affect money supply?

OMO affects money supply because it directly affects banks' excess reserves, which is what banks use to create money.

- If the Fed wants to **DECREASE** the money supply, it will **SELL T-bills**:
  - ▶ in exchange for the T-bills, the Fed decreases the reserves of the seller
  - ▶ with fewer reserves, banks decrease loans
  - ▶ money supply decreases as the loans/money creation process ripples through the economy in reverse (money multiplier working backward)

## Exercise

Consider this  $T$  – *Account* of a commercial bank.

Assets		Liabilities	
Required reserves	\$100	Deposits	\$1,000
Loans	\$400		
Treasury bills	\$800		

Suppose this is the only bank and all money is held in this bank. There are no excess reserves. If the Fed makes an open-market sale of T-bills worth \$50 to this bank, what will happen to the money supply after all adjustments are made?

- money supply will increase
- money supply will decrease

What if there was an open-market purchase of T-bills worth \$50 by the Fed?

# Monetary policy and interest rate

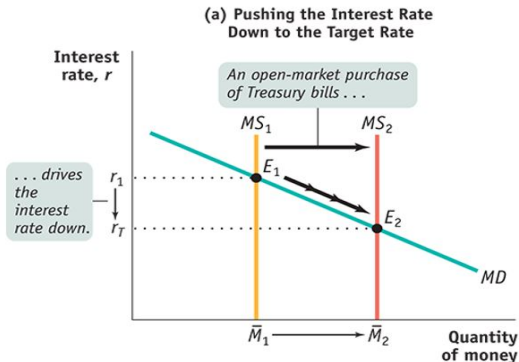
- By adjusting the money supply up or down, the Fed can set the interest rate (the federal funds rate).
- The Fed sets a target federal funds rate and undertakes the appropriate open-market operations.
- Fed has a “target” interest rate to ensure price stability.
  - ▶ Current target is between 0.00 – 0.25 percent.

# Monetary policy: How does the Fed use OMO in practice?

- The Open Market Desk of the Federal Reserve Bank of New York adjusts the money supply through the purchase and sale of Treasury bills until the actual federal funds rate equals the target federal funds rate.
  - ▶ In other words, the open market desk of the NY Fed conducts OMOs—to achieve the targeted federal funds rate.

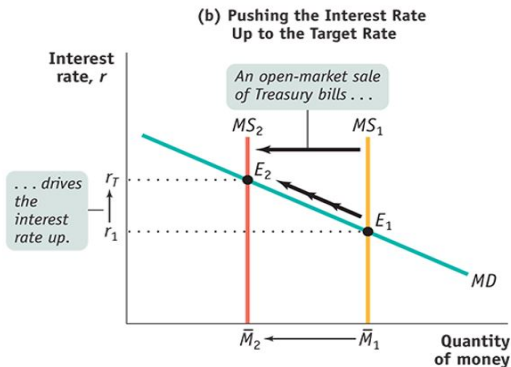
# Monetary policy: How does the Fed use OMO in practice?

- If the actual federal funds rate is greater than the target federal funds rate, the Fed will increase the money supply by making an open-market purchase of Treasury bills, which will increase the money supply and decrease the interest rate.



# Monetary policy: How does the Fed use OMO in practice?

- If the actual federal funds rate is lower than the target federal funds rate, the Fed will decrease the money supply by making an open-market sale of Treasury bills, which will decrease the money supply and raise the interest rate.



# The Fed and monetary policy

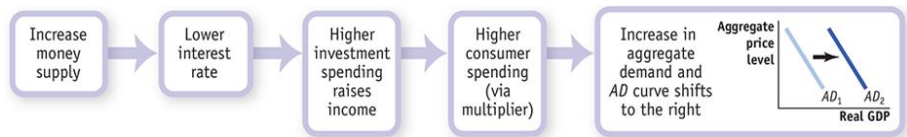
- A common mistake is to imagine that changes in the way the Federal Reserve operates alter the way the money market works.
- In fact, **the money market works the same way as always**: The interest rate is determined by the supply and demand for money.
- The **only difference** is that now the Fed adjusts the supply of money to achieve its target interest rate.



## Expansionary and contractionary monetary policy

# Expansionary monetary policy

You guessed it, expansionary monetary policy increases aggregate demand (shifts AD to the right). It's also called "loose monetary money policy".



## Question 1:

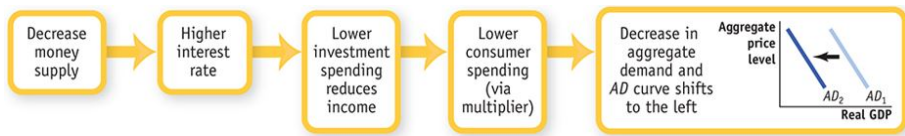
Does the Fed increase to decrease the federal funds rate to implement an expansionary monetary policy?

## Question 2:

Does the Fed buy or sell T-bills to implement an expansionary monetary policy?

# Contractionary monetary policy

Contractionary monetary policy is also called “tight” money policy. It reduces aggregate demand (shifts AD curve to the left).



## Question 3:

Does the Fed increase or decrease the required reserve ratio ( $rr$ ) to implement a contractionary monetary policy? Why?

### Question 4:

Currently the economy's real GDP is \$20 trillion. The Potential real GDP is \$20.5 trillion. It is most likely that the Fed will engage in:

- Open market purchases of Treasury bills.
- Open market sales of Treasury bills.

### Question 5:

The Fed reduced its federal funds rate target to 0.0 – 0.25% in mid March 2020. On April 29, 2020, the Fed chair Jerome Powell pledged to keep the rate within that range until the economy returns to full employment.

Answer the following questions:

- Why did the Fed reduce the federal funds rate in mid March? [Hint: which macroeconomic gap was it anticipating?]
- Why does Powell want to keep the rates close to zero until the economy returns back to full employment?

### Question 6

On April 29, Wall Street Journal published an article titled “Fed’s Powell Says More Spending Will Be Needed From Congress”. Which policy is Powell hinting at?

- expansionary monetary policy
- expansionary fiscal policy
- contractionary monetary policy
- contractionary fiscal policy

## Question 7

On April 29, 2020, WSJ ran another article titled “U.S. Economy Shrank at 4.8% Pace in First Quarter”. This most likely means that the economy is facing a recessionary gap (i.e., a negative output gap). What should the Fed do in this situation?

- ① increase interest rate (federal funds rate)
- ② sell T-bills
- ③ reduce taxes or increase unemployment benefits/other direct cash transfers
- ④ increase government spending
- ⑤ both 3 and 4
- ⑥ none of the above

# How does Fed decide which policy to use?

How does the Fed decide whether to use expansionary or contractionary monetary policy? And how much money supply is enough?

- It depends on its two major policy goals
  - 1 Fight recessions (business cycle)
  - 2 Ensure price stability (inflation)
    - ★ since 2012, the Fed announced that its inflation target is 2% annual inflation rate



# The Taylor Rule

For many years, the Fed followed the **Taylor Rule** for guidance on setting the federal funds rate. This rule uses past data on inflation and unemployment rate (or output gap) to calculate the target federal funds rate.

- **Taylor rule for monetary policy:** set the federal funds rate according to the level of the inflation rate and either the output gap or the unemployment rate. (Note: these are past data.)

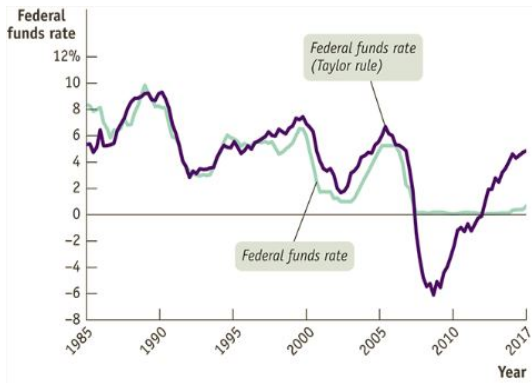
Taylor Rule looked like this between 1988 and 2008:

**Federal funds target rate** =  $2.07 + 1.28 \times \text{inflation rate} - 1.95 \times \text{unemployment gap}$ ,

where **unemployment gap** is the difference between the actual unemployment rate and the natural rate of unemployment. **Inflation** is the measure of change in prices of consumer prices excluding food and energy prices.

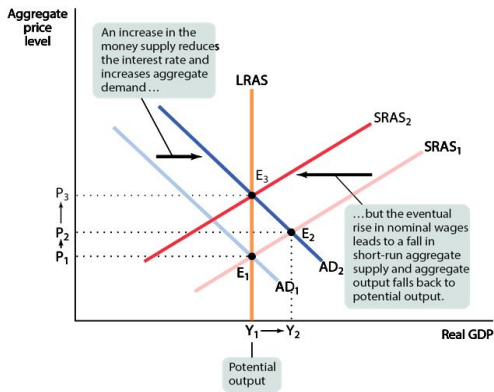
# The Taylor Rule between 1988 and 2008

The Fed closely followed this (Taylor) rule between 1988 and 2008.:  
Federal funds target rate =  $2.07 + 1.28 \times \text{inflation rate} - 1.95 \times \text{unemployment gap}$ ,



# Short and long run effects of money supply

- We know that **change in quantity of money** has “**real effect**” in **the short run**, i.e., it shifts AD curve to the left or right.
- In the long run, however, economists believe that changes in the quantity of money affect the price level but not the output or interest rate.
- In other words, money has no “**real effects**” in the long run.



## Question 8

Consider these data points. The inflation rate in March 2020 was 2.3% compared to April 2019. The Congressional Budget Office estimates that the natural rate of unemployment is 4.7%. The St. Louis Fed data shows that the March 2020 unemployment rate was 4.4%. With this data, what interest rate would you set if you were to follow the Taylor Rule?

Here's the rule for you:

Federal funds target rate =  $2.07 + 1.28 \times \text{inflation rate} - 1.95 \times \text{unemployment gap}$