Monetary Policy and the Federal Reserve System

Econ 4021, Washington University in St. Louis

Miguel Faria-e-Castro
Federal Reserve Bank of St. Louis

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Introduction

- Monetary and fiscal policy are the two primary tools of macroeconomic stabilization
- Monetary variables affect nominal variables in the long-run, and can also affect real variables in the short-run in models where money is not neutral
- We have talked about policy experiments such as "expansions in the money supply"
  - But how exactly does the central bank expand the money supply?
  - How does this relate to "setting interest rates"?
  - Should monetary policy follow systematic rules?
  - Should monetary policy be independent from fiscal policy?

Introduction

This series of lectures:

1. Principles of Money Supply Determination
2. Monetary Policy Targets
3. Monetary Control in the United States
4. Monetary Policy in Practice
5. Rules vs. Discretion

1. Principles of Money Supply Determination

Money Supply Determination

- So far we have treated M^s as being controlled by the central bank
- In practice, M^s depends on decisions by three groups
  1. The central bank, the government institution responsible for monetary policy
  2. Depository institutions (i.e., banks) that accept deposits and make loans to the public
  3. The public (people and firms) who hold money as currency or deposits in banks
- Our analysis will focus on the Fed and the US economy
- A similar analysis applies to almost any central bank in an advanced market economy

The Fed's Balance Sheet

Federal Reserve Bank

Assets		Liabilities	
Securities	\$ 900	Currency held by public	\$ 700
Gold	\$ 100	Vault cash held by banks	\$ 100
		Reserve deposits	\$ 200
Total Assets	\$ 1,000	**Total Liabilities**	\$ 1,000

- Vault cash is currency held by banks
- Bank reserves include vault cash and reserve deposits
- The sum of bank reserves and currency held by the public is the **monetary base**
- Also known as high-powered money, or *MB*

$$BASE = \text{Currency held by public} + \text{Vault cash} + \text{Reserve deposits}$$

Balance Sheet of the Banking Sector

Consolidated Balance Sheet of Banks

Assets		Liabilities	
Vault cash	\$ 100	Deposits	\$ 3,000
Reserve deposits	\$ 200		
Loans	\$ 2,700		
Total Assets	\$ 3,000	**Total Liabilities**	\$ 3,000

- The vault cash and reserve deposits are the same that show up in the Fed's balance sheet
- The sum of these is called **bank reserves**, and are liquid assets held by banks

$$\text{Bank Reserves} = \text{Vault Cash} + \text{Reserve Deposits}$$

- These assets are used to satisfy deposit withdrawals or other liquidity shortfalls
- Banks did not earn any interest on reserves until 2008, when the Fed started paying interest (at the IORB rate)

Bank Reserves

- Banks can use the money that is lent to them as deposits to invest in
  1. Loans to the private sector (or other securities)
  2. Reserve deposits
- Loans are riskier as they may default, but they tend to earn a higher return than the interest paid on reserves
- The **reserve-deposit ratio** is the ratio of reserves to deposits

$$\frac{\text{reserves}}{\text{deposits}} = \frac{\$300}{\$3,000} = 10\%$$

- A banking system where the reserve-deposit ratio is less than 100% is called **fractional reserve banking**

Fractional Reserve Banking

- Most advanced economies operate under fractional reserve banking systems
- In fractional reserve banking systems, banks may invest a fraction of the deposits they receive
- Some people argue that banks should only be able to invest in reserves, a system called **full-reserve banking** (or 100% reserve banking)
- In such system, banks would be very safe (as reserves never default), but they would earn very little return
  - Banks would essentially be giant vaults
  - Banks would likely charge customers to keep their deposits
- Banks are typically subject to **reserve requirements** that impose a minimum reserve deposit ratio
- The US eliminated reserve requirements in 2020

Open Market Operations

- Historically, the Fed changed the money supply via **open market operations**
  - The Fed operates differently nowadays, but this is a useful benchmark
- It purchases/sells securities from the public, exchanging them for newly created/destroyed currency
- Assume the Fed purchases $100 worth of securities from a private investor
- This investor proceeds to deposit those $100 in a private bank
- This increases securities held by the Fed, as well as the reserve account of that bank

Open Market Operations

Federal Reserve Bank

Assets		Liabilities	
Securities	$ 1,000	Currency held by public	$ 700
Gold	$ 100	Vault cash held by banks	$ 100
		Reserve deposits	$ 300
Total Assets	$ 1,100	**Total Liabilities**	$ 1,100

Consolidated Balance Sheet of Banks

Assets		Liabilities	
Vault cash	$ 100	Deposits	$ 3,100
Reserve deposits	$ 300		
Loans	$ 2,700		
Total Assets	$ 3,100	**Total Liabilities**	$ 3,100

Open Market Operations

- Assume that the minimum reserve-deposit ratio is 10%
- The bank now has too many reserves, with a ratio of $\$400/\$3100 = 12.9\%$
- The bank may want to lend out some of those extra reserves in order to earn a higher return
- It lends \$90 to Consumer 1, who uses it to purchase goods from Consumer 2
- Consumer 2 then deposits those \$90 in their own bank

Consolidated Balance Sheet of Banks

Assets		Liabilities	
Vault cash	\$ 100	Deposits	\$ 3,190
Reserve deposits	\$ 300		
Loans	\$ 2,790		
Total Assets	\$ 3,190	**Total Liabilities**	\$ 3,190

Open Market Operations

- The bank's reserve-deposit ratio is still $\$400/\$3190 = 12.5\% > 10\%$
- So the bank may keep making more loans until its reserve ratio reaches 10%
- Bank reserves always equal \$400, as each loan "returns" as a deposit
- Deposits keep increasing as new loans are made
- The process stops when total bank deposits equal $\$400/0.1 = \$4,000$

Consolidated Balance Sheet of Banks

Assets		Liabilities	
Vault cash	\$ 100	Deposits	\$ 4,000
Reserve deposits	\$ 300		
Loans	\$ 3,600		
Total Assets	\$ 4,000	**Total Liabilities**	\$ 4,000

OMOs and the Money Multiplier

- Note that the Fed's initial money supply expansion was of \$100
- Yet it led to additional deposits in the banking system equal to \$1,000
- Under a fractional reserve banking system, an expansion of the monetary base leads to a larger increase in the money supply
- This effect is called the **money multiplier**

The Money Multiplier

By how much does an increase in the monetary base increase money supply?

- The money supply is equal to currency held by the public plus deposits at banks

$$M = CU + DEP$$

- The monetary base is equal to currency held by the public plus bank reserves (which include vault cash and reserve deposits)

$$BASE = CU + RES$$

- The ratio of the money supply to the monetary base is thus

$$\frac{M}{BASE} = \frac{CU + DEP}{CU + RES}$$

- Divide numerator and denominator by DEP to obtain

$$\frac{M}{BASE} = \frac{\frac{CU}{DEP} + 1}{\frac{CU}{DEP} + \frac{RES}{DEP}}$$

The Money Multiplier

$$\frac{M}{BASE} = \frac{\frac{CU}{DEP} + 1}{\frac{CU}{DEP} + \frac{RES}{DEP}}$$

- $cu = \frac{CU}{DEP}$ is the currency-deposit ratio: it is determined by the public and depends on how much money they want to hold in currency vs. deposited at the bank

- $res = \frac{RES}{DEP}$ is the reserve-deposit ratio: it is determined by either regulation or bank's optimal allocation of their own assets

The Money Multiplier

- We can then rewrite the expression for money supply as

$$M = \left(\frac{cu + 1}{cu + res} \right) BASE$$

- The money supply is a multiple of the monetary base
- Because $res < 1$ in a fractional banking system, the money supply is larger than the monetary base
- $\frac{cu+1}{cu+res} > 1$ is called the **money multiplier**
- The money multiplier falls when either *cu* or *res* increase
  - If *cu* rises, people hold more cash each time they get a loan and so they deposit a smaller fraction at the bank
  - If *res* rises, banks need to hold a larger fraction of each new deposit as reserves and so they lend less after receiving a deposit

The Money Multiplier in the US

Currency held by the nonbank public, CU	\$1,575.9 billion
Bank reserves, RES	\$2,022.5 billion
Monetary base, $BASE$ (= $CU + RES$)	\$3,598.4 billion
Deposits, DEP	\$12,395.1 billion
Money supply, M (= $CU + DEP$)	\$13,971.0 billion
Reserve−deposit ratio, res (= RES/DEP)	0.1632
Currency−deposit ratio, cu (= CU/DEP)	0.1271
Money multiplier $(cu + 1)/(cu + res)$	3.88
Ratio of money supply to base, $M/BASE$	3.88

Source: Federal Reserve Statistical Releases H.3 and H.6, June 14, 2018. In these calculations, we use a broad measure of deposits that includes retail money market mutual funds in addition to all deposit categories included in M2; and the money supply is M2. Data are for May 2018. For recent data and historical series, see `www.federalreserve.gov/releases`.

Bank Runs

Consider a bank that holds 10% of its deposits as reserves

- If less than 10% of its deposits are withdrawn at a time, the bank can use its reserves to satisfy these withdrawals
- But if people try to withdraw more than 10% of their deposits, the bank may exhaust its reserves and "run out of cash"
- It still has loans, but these loans tend to be illiquid and may not be readily convertible into cash required to satisfy deposit withdrawals
- If people think that other people are withdrawing, they may panic and rush to withdraw their money before the bank runs out of reserves

Bank Runs

Bank runs were very common before 1933

Bank Runs

Why did bank runs stop (to an extent) in 1933?

- The Federal Government created the **Federal Deposit Insurance Corporation** (FDIC) to insure bank deposits
- The FDIC promises to repay all deposits up to a certain amount in the event that bank fails
- This assuages people's worries that the bank may run out of reserves
  - Even if others are withdrawing, I will still get my money back (up to an amount)
  - Bank withdrawals are no longer self-reinforcing
- Douglas Diamond and Philip Dybvig developed a simple model that illustrates this mechanism

The Diamond-Dybvig Model of Bank Runs

- Assume that a bank can take \$100 and invest it in a project that generates $R > 1$ per dollar invested two periods from now
- The bank can liquidate the project in the intermediate period, but then it only yields $\lambda < 1$ per dollar invested
- You plus 99 other people decide to deposit \$1 today so the bank can undertake the project
- These are demand deposits, so you are free to withdraw them at any time for \$1, including at the intermediate period
- **Problem**: What if a large number of people start withdrawing early, forcing the bank to liquidate the project, and then nothing is left for you?

The Diamond-Dybvig Model of Bank Runs

The model has three periods:

1. **Initial**: people make deposits at the bank, and the bank uses deposits to start the project

2. **Intermediate**: people may withdraw deposits, bank may terminate project early and earn $\lambda < 1$ return per dollar

3. **Final**: project ends generating $R > 1$ return per dollar, and bank repays depositors

The Diamond-Dybvig Model of Bank Runs

Let's assume all the other 99 people do the same regardless of what you do

- If everybody else keeps...
  1. ..and you also keep, you get paid $R > 1$ at the end
  2. ...but you withdraw, the bank has to liquidate the project and you receive 1
- If everybody else withdraws, the bank liquidates the project
  1. If you keep, everybody else is paid before you and you get zero.
  2. If you also withdraw, everybody gets the liquidation value λ
- We can summarize the game in a payoff matrix:

		Everyone else: Keep	Everyone else: Withdraw
You: Keep		R	0
You: Withdraw		1	λ

The Diamond-Dybvig Model of Bank Runs

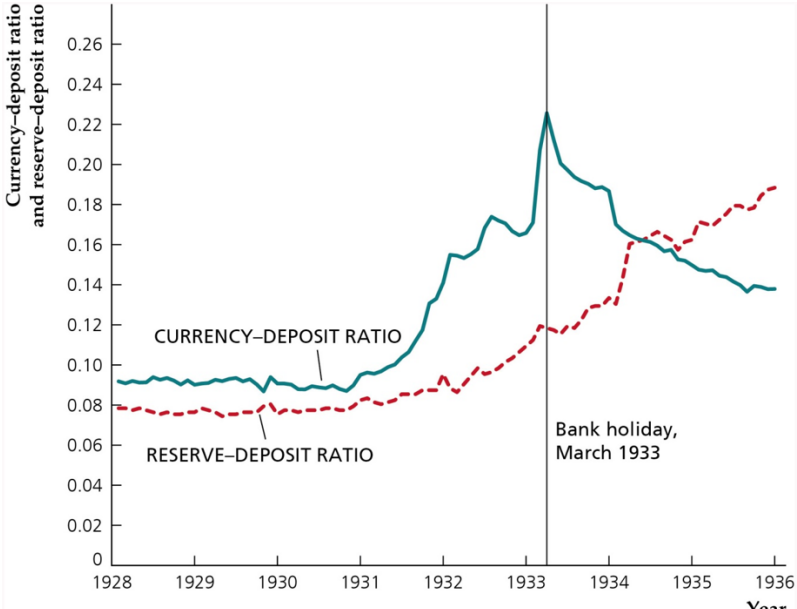
		Everyone else: Keep	Everyone else: Withdraw
You: Keep		R	0
You: Withdraw		1	λ

- Your best response is **to keep if everybody else keeps**, and withdraw if everybody else withdraws
- There are multiple Nash Equilibria to this game
- The mass withdrawal Nash Equilibrium is a bank run
- The FDIC can eliminate this equilibrium by promising to pay 1 to everybody who keeps
- Then "Keep" becomes a best response and the unique Nash Equilibrium

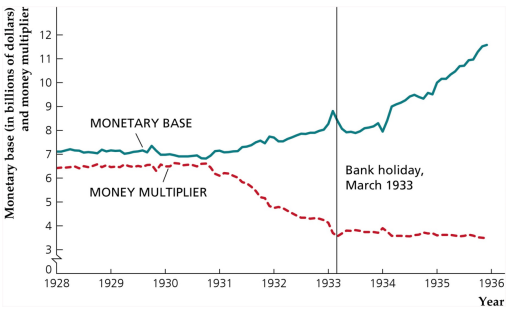
The Money Multiplier during the Great Depression

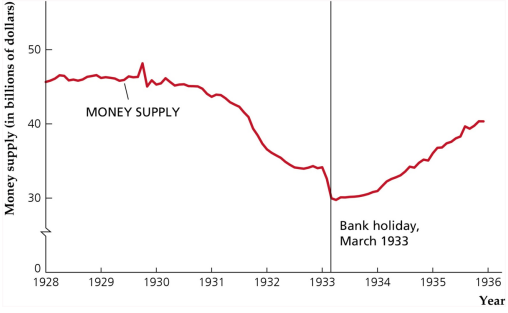
- Milton Friedman and Anna Schwartz collected data on the money supply and relevant ratios during the Great Depression
- Many factors conspired to start a banking panic in 1930
  1. Falling agricultural prices disrupted Midwestern state economies
  2. The failure of the (private) Bank of the United States in December 1930
  3. The failure of Austria's largest bank in 1931
  4. Great Britain abandoning the gold standard in 1931
- People felt safer holding currency than depositing in banks, $cu \uparrow$
- Anticipating runs, banks started holding more reserves $res \uparrow$
- Both factors led to a fall in the money multiplier
- Monetary base did not expand fast enough $\Rightarrow$ money supply fell

The Money Multiplier during the Great Depression



The Money Multiplier during the Great Depression

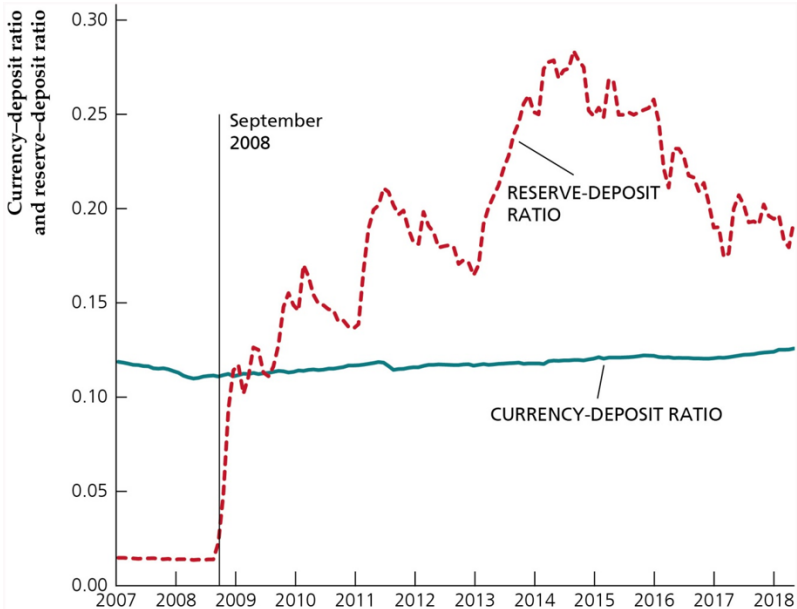




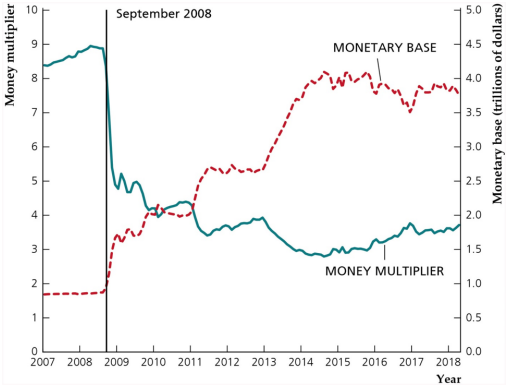
The Money Multiplier during the Great Recession

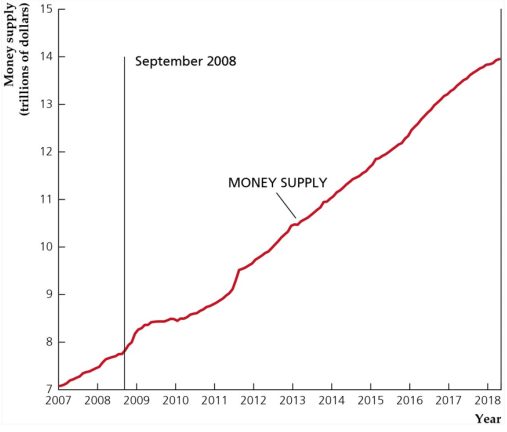
- During the 2007-08 financial crisis the existence of the FDIC prevented *cu* from rising
- Instead, investors sold stocks and bonds and deposited the proceeds in banks, thus $cu \downarrow$
- As in the Great Depression, banks chose to greatly expand the amount of reserves, $res \uparrow$
- Why was this?
  - The Fed began a policy of **quantitative easing**, which consisted of purchasing securities from financial institutions
  - These OMO led to large cash inflows for banks, who did not have many good lending opportunities because the economy was depressed
- The effect of $res \uparrow$ dominated $cu \downarrow$ and so the money multiplier fell
- Monetary base expanded faster this time, offsetting the drop in the money multiplier

The Money Multiplier during the Great Recession



The Money Multiplier during the Great Recession





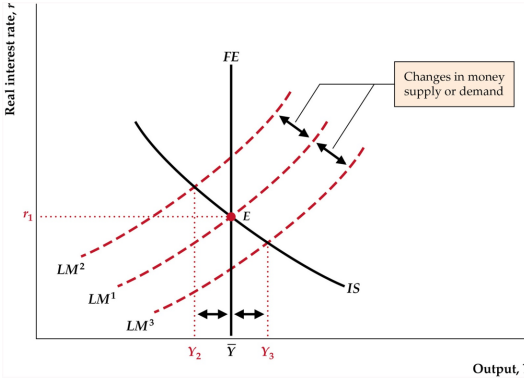
2. Monetary Policy Targets

Intermediate Targets

- Central banks typically have objectives over macroeconomic variables
- The Fed, for example, has a **dual mandate**
  - Price stability
  - Maximum sustainable employment
- ...but the Fed has no direct control over inflation or unemployment!
- In order to guide monetary policy, the Fed uses **intermediate targets**: indicators that affect economic activity and over which the Fed has some degree of control
- Historically, the most frequently used intermediate targets were
  - Measures of money supply, such as M1 or M2
  - Short-term interest rates, such as the Federal Funds Rate (FFR)

Intermediate Targets

- The Fed cannot target simultaneously target money supply and the FFR
- The Fed can either target M^s directly, which causes the $IS - LM$ equilibrium to yield a certain r
- Or it can target a certain r, which implies a necessary movement in M^s
- In recent decades, the Fed has targeted the FFR



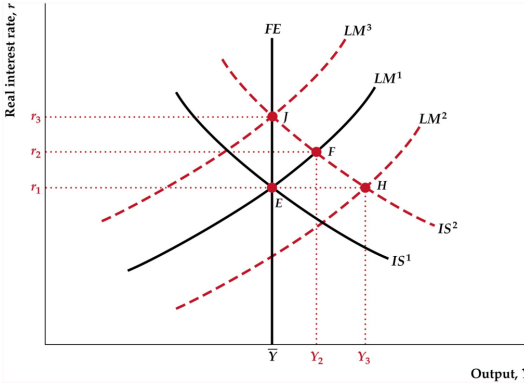
Targeting the FFR

- Targeting the FFR works well to stabilize the economy if most shocks are to the LM curve
- Then the Fed can simply adjust M^s to expand or contract the LM so as to maintain full-employment $\bar{Y}$ *and* its interest rate target r_1
- But a constant interest rate target causes problems if the economy is subject to other types of shocks

Targeting the FFR

Consider a positive shock to the IS curve

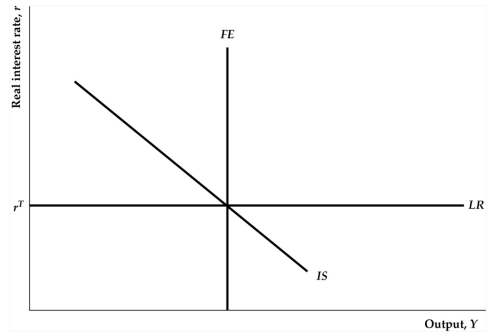
- If the Fed wants to keep r_1 constant, it needs to expand M^s to make LM shift to the right
- This makes output increase even more, and will eventually result in a larger price increase
- The only way to keep output close to potential and prevent prices from rising is to raise $r_1 \uparrow r_3$
- Fed needs to adjust its target in response to non-LM shocks



The LR Curve

It is possible to adjust the $IS - LM$ model to account for r-targeting

- We replace the LM curve with the LR curve
- The LR curve is flat at the target r^T
- The Fed changes money supply in whatever way is needed to keep $r = r^T$
- Shocks to money demand or supply are automatically offset
- This is an extension of the $IS - LM$ model, known as the $IS - MP$ model

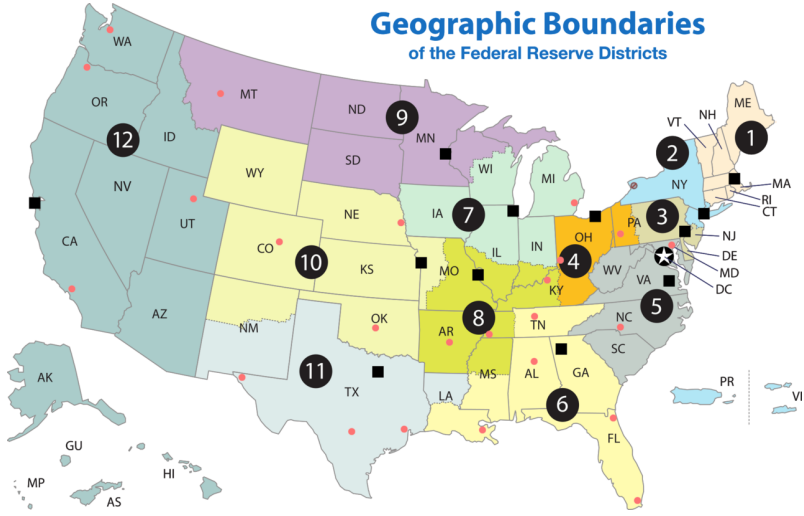


3. Monetary Control in the United States

The Federal Reserve System

- The Federal Reserve System (FRS, or "the Fed") is the central bank of the United States
- It was created by the Federal Reserve Act of 1913 in response to severe financial crises that affected the US economy in the late 19th and early 20th centuries
  - The Panic of 1907 ended with a private banker (J. P. Morgan) coordinating a syndicate of bankers to act as "lenders of last resort"
  - Policymakers agreed that this activity should be undertaken by a public institution and not be left to the hands of private bankers
- The Fed is composed by three entities:
  1. Twelve regional Federal Reserve Banks
  2. Board of Governors of the FRS
  3. Federal Open Market Committee (FOMC)

Federal Reserve Districts



Structure of the Fed

1. Federal Reserve Banks
   - Oversee operations of banks in their respective districts
   - Advocate for different economic groups in their districts
   - Conduct economic research
2. Board of Governors in Washington, D.C.
   - 7 governors, appointed for staggered 14-year terms
   - One of the governors is appointed as the **chair** for a renewable 4-year term
   - The Fed Chair is one of the leading economic policymakers in the US
3. Federal Open Market Committee
   - 7 governors + President of the NY Fed + rotating group of 4 FRB presidents
   - Meet 8 times a year in Washington, D.C. to set monetary policy
   - FOMC announces monetary policy decisions at a press conference after each meeting

The Fed's Mandate and Toolkit

- The Fed's mandate, i.e. its ultimate objectives, is to promote
  1. Price stability
  2. Maximum (sustainable) employment
- The Fed fulfills its mandate by setting an **intermediate target**: the Federal Funds Rate (FFR)
- Historically, the FFR was set via **open market operations**
- Nowadays, the Fed's **conventional monetary policy toolbox** sets the FFR using four tools:
  - Interest on Reserve Balances (IORB)
  - Overnight Reverse Repurchase Agreement Facility (ONRRP)
  - The discount window
  - Open market operations
- The Fed's **unconventional monetary policy tools** include
  - Balance sheet policy
  - Forward guidance

The Balance Sheet of the Fed (as of 4/9/2025)

Federal Reserve System, billions of USD

Assets		Liabilities	
Gold	$ 11.0	Currency (Federal Reserve notes)	$ 2,327.3
Loans to depository institutions	$ 4.5	Reverse repo (ONRRP)	$ 534.3
U.S. Treasury Securities	$ 4,219.5	Deposits of depository institutions	$ 3,721.4
Federal Agency Debt	$ 2.3	U.S. Treasury General Account	$ 315.2
Mortgage-backed securities	$ 2,188.9	Other liabilities and Net Worth	$ -170.8
Other securities	$ 223.6		
COVID lending facilities	$ 7.3		
Other assets	$ 70.2		
Total Assets	$ 6,727.4	**Total Liabilities and Net Worth**	$ 6,727.4

Balance sheet as of April 9, 2025

The Balance Sheet of the Fed

- The monetary base is equal to currency plus reserve deposits
- The monetary base was equal to $ 6,048 bn as of 4/9/2025
- Currency (Federal Reserve notes) includes all the money that has actually been *printed*
  - Currency held by the public
  - Vault cash of depository institutions
- Reserve deposits of depository institutions includes money that could potentially be printed
- It is convenient for banks to keep their reserve deposits at the Fed

The Federal Funds Rate and Monetary Policy Transmission

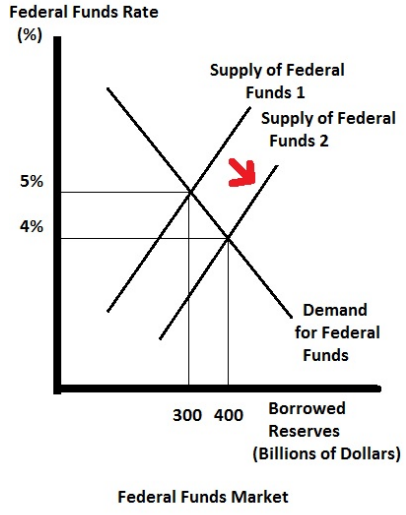
- At each FOMC meeting, the Fed announces a **target for the FFR**
- The FFR is the rate at which banks lend reserves to each other overnight
  - At the end of each day, some banks may end up with more reserves than they need, and others with less than what they need
  - The ones with excess reserves can lend to those with a deficit as unsecured overnight loans
- The FFR determines the cost of funds for banks, and affects the interest rates that they set on their own lending
- This directly and indirectly affects all other interest rates in the economy

Historical Monetary Policy Implementation: OMO's

- Before the 2010's, the Fed would implement the FFR target by conducting open market operations in the federal funds market
- Banks that need funds have a downward sloping demand
  - If funds are very costly, they find other ways of satisfying their need for funds
- Banks with excess funds have an upward sloping supply
  - If the rate on funds is high, they prefer to lend them rather than use them somewhere else
- The equilibrium rate is the FFR

Historical Monetary Policy Implementation: OMO's

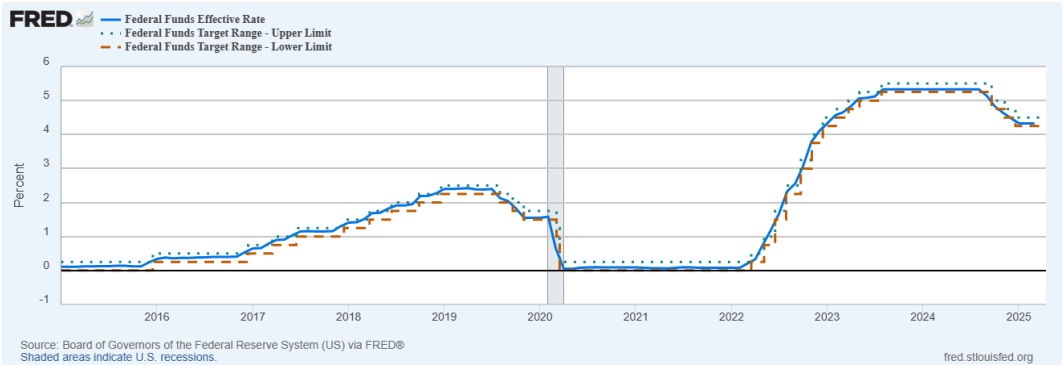
- If the Fed wanted to lower the FFR, it expanded the supply curve
- It did so by purchasing securities from banks, trading them for reserves
- This increased the amount of reserves in the fed funds market and lowered the equilibrium FFR



Ample Reserves or Floor System

- In the 2010s, the Fed changed the way it implements monetary policy
- It moved from the traditional "scarce reserves" system to an **ample reserves regime**
  - Also known as a floor system
- This involved creating so many reserves that the demand for reserves is effectively satiated
- Instead of using OMOs to adjust supply and hit the FFR target, the Fed now uses different tools

The Federal Funds Rate Target Range



The Fed uses four key tools to ensure that the FFR stays within the target range.

FFR Tool 1: Interest on Reserve Balances (IORB)

- The IORB is the interest rate paid on reserve balances held by banks at the Fed
- This works as a **reservation rate** for banks: since reserves are a risk-free investment, it works as a lower bound on the interest rate banks are willing to lend at
- It is also lower bound on the FFR, meaning that $FFR > IORB$
  - If the IORB was higher than the FFR, then banks could make profits by borrowing from other banks and depositing those funds as reserves at the Fed (earning the IORB)
  - No arbitrage ensures that the FFR does not deviate much from the IORB
- The IORB is the Fed's primary tool to control the FFR

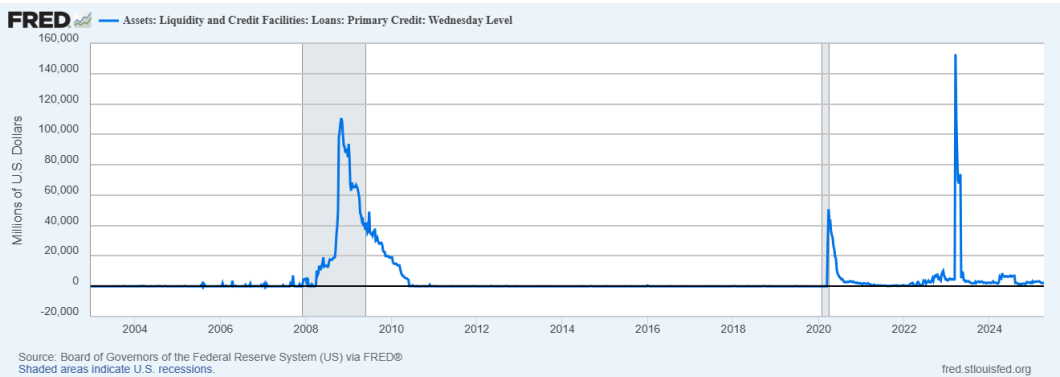
FFR Tool 2: Overnight Reverse Repurchase Agreement Facility (ONRRP)

- Only banks are allowed to have accounts at the Fed and thus earn the IORB
- But nonbank financial institutions have become larger and an increasingly important part of the US financial system
  - BlackRock, Fidelity, PIMCO, Vanguard, etc.
- To ensure that monetary policy transmission also affects nonbank financial institutions, the Fed created the ONRRP in 2014
- The Fed wanted to avoid situations where nonbank institutions lent at rates lower than the IORB
- The Fed undertakes overnight "reverse repo" contracts with these institutions
  - The Fed sells securities to an institution, and purchases them back the following day at a slightly higher price
  - This generates a small return for the institution, equal to the ONRRP rate
- The ONRRP is the **floor of the FFR**

Tool 3: The Discount Window

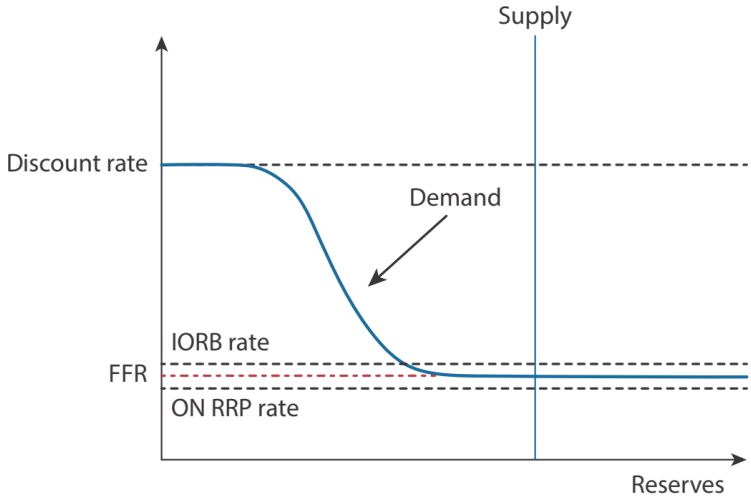
- One of the main reasons the Fed was founded was to act as a "lender of last resort"
  - i.e., someone who stands ready to lend to banks who need liquidity to satisfy deposit withdrawals or reserve requirements
- This function is performed through the **discount window**, which lends to banks at a **discount rate**
- This rate is higher than other interest rates to discourage its use during normal times
  - During normal times, the Fed prefers to avoid intervening and encourages banks to lend among each other
  - This is a "worst-case" scenario loan for banks
- The DR acts as a **ceiling** for the FFR

Discount Window Borrowing



Spikes during (i) Great Financial Crisis, (ii) COVID-19, (iii) SVB/Regional banking crisis

Monetary Policy with Ample Reserves

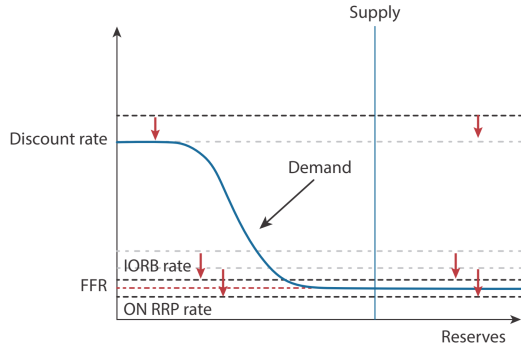


Tool 4: Open Market Operations

- OMO's were the main tool of monetary policy implementation before ample reserves
- The Fed would purchase/sell government securities to shift the supply of funds and hit a target rate
- Nowadays, the Fed conducts OMOs to ensure that reserves remain ample
  - i.e., to ensure that the supply of reserves is such that the equilibrium FFR is in the "flat part" of the reserve demand curve
- This ensures that the FFR can be targeted using the IORB and the ONRRP

Expansionary Monetary Policy

- Assume that the economy is weak, and the Fed wants to stimulate it
- The Fed announces a reduction in the FFR target range
- It implements it by lowering the three administered rates: DR, IORB, ONRRP
- This shifts the demand for reserves down
- The Fed hits the new FFR target
- Open market purchases may be used to ensure that reserves remain ample



Unconventional Monetary Policy and the Great Recession

- The 2007 housing crisis led to losses at financial institutions
- These turned into the worst financial crisis and recession episode since the Great Depression
- Even after it ended in June 2009, the economy recovered very slowly
- Monetary policy faced a series of challenges in trying to stabilize the economy and help the recovery

Unconventional Monetary Policy and the Great Recession

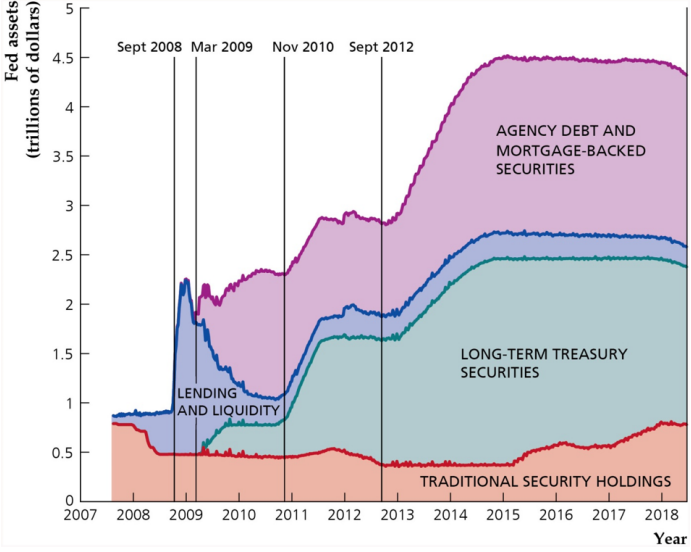
- As the economy started entering a recession in 2008, the Fed lowered interest rates
- By the end of 2008, the Fed had cut interest rates to near zero
- The economy was in a **liquidity trap**: a situation in which further expansions of money supply have no effect on interest rates and therefore on private spending
- This forced the Fed to adopt **unconventional monetary policy tools**
  - **Forward guidance**, through which it signaled to markets how long it expected interest rates to remain low so as to lower longer-term interest rates
  - **Quantitative Easing**, through which the Fed purchased longer term US Treasuries and agency debt (Fannie Mae and Freddie Mac)

Quantitative Easing

How does QE work?

- Short-term interest rates were already at zero, so there was nothing the Fed could do about that
- But many private spending decisions depend on longer-term interest rates
  - People buying a home look at the 30-year mortgage rate
  - Firms deciding to invest look at longer-term rates on bank loans, which depend on other longer-term rates such as those on US Treasuries
- By purchasing longer term securities, the Fed raises their price and thus lowers their yield/interest rate
- This is designed to stimulate longer-term spending decisions by households and firms
- This increase in spending in turn generates inflation and prevents deflation

Fed assets around the Great Recession



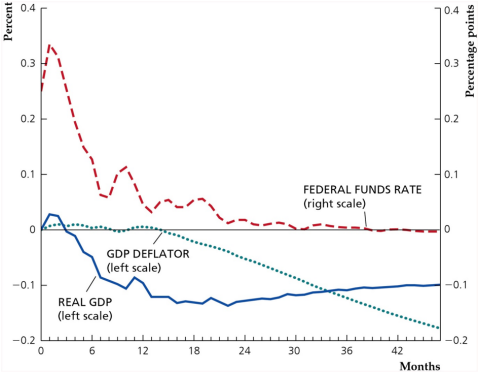
4. Monetary Policy in Practice

Monetary Policy in Practice

- Monetary policy looks easy in the $IS - LM$ model
  - just adjust M^s to hit a target rate
- In practice, it is not so easy to do this
  - Lags in the effects of policy
  - Uncertainty about the state of the economy
  - Expectations

Monetary Policy Lags

- Changes in monetary policy take a long time to propagate and influence the economy
- Interest rates react quickly to changes in monetary policy, but other variables can take years
- FOMC cannot base its decisions on current variables alone, but must try to forecast what inflation and unemployment will be in the future



Uncertainty

- Policymakers try to measure the state of the economy by looking at hundreds of economic variables
- In practice no one – not even the FOMC – knows the "true" state of the economy at a given point in time
- Even if we did know the true state of the economy, what is the right *model* of the economy?
  - Classical or Keynesian?
  - What are the slopes of the *IS* and *LM* curves?
  - What are the values of $\bar{Y}$ and $\bar{u}$?
- Uncertainty about the structure of the economy should make policymakers be less aggressive in their responses
- How do shocks and policy actions affect public expectations?
  - Fed has tried to improve its *communication strategy* after the Great Recession
  - Be more clear about what it wants to do and how it wants to do it

5. Rules vs. Discretion

Rules vs. Discretion

- Classicals and Keynesians agree that due to long-run monetary neutrality, a low and stable inflation rate is desirable in the long-run
- Most of the disagreement arises regarding the short-run conduct of monetary policy
- A key question is whether monetary policy should stick to a set of pre-specified rules or if it should be conducted at the discretion of the central bank

Rules

- Classicals and *monetarists* advocate the use of sets of pre-specified rules
- These rules make policy automatic/algorithmic: if x happens, do y with interest rates, for example:
  - Increase monetary base by 1% each quarter
  - Keep the price of gold fixed (gold standard)
- Rules should be simple, without many exceptions, and easy to communicate
- Rules should be prescriptions over intermediate targets over which the Fed has control
  - They should not be of the kind "keep unemployment at 4%", because the Fed cannot directly control unemployment
- Rules may allow the Fed to respond to the state of the economy

Discretion

- Keynesians tend to support discretion, i.e. the Fed's freedom to conduct monetary policy in any way required to achieve its objectives
- The Fed should monitor the economy at all times and respond actively to changes in economic cirucmstances
- Since discretion gives the Fed more freedom to act while rules constrain its behavior, why do so many people advocate for rules?

The Monetarist Case for Rules

- **Monetarists** are a group of economists who emphasize the importance of monetary factors in the macroeconomy
- The leading monetarist was Milton Friedman, who argued that the central bank should follow rules for setting policy
- Friedman made the case for rules via 4 propositions
  1. Monetary policy has powerful short-run effects on the real economy. In the longer run, however, changes in the money supply have their primary effect on the price level.
  2. Despite the powerful short-run effect of money on the economy, there is little scope for using monetary policy actively to try to smooth business cycles.
  3. Even if there is some scope for using monetary policy to smooth business cycles, the Fed cannot be relied on to do so
  4. The Fed should choose a specific monetary aggregate (such as M1 or M2) and commit itself to making that aggregate grow at a fixed percentage every year

Rules and Central Bank Credibility

- Monetarist case for rules essentially rests on the premise that the Fed is either incompetent or subject to political interference
- Most economists question these two assumptions
  - US monetary policy has been reasonably well run since World War II and serves as a global model for many countries
  - The Fed is staunchly independent from the executive branch
- Still a case for rules can be made, based on the fact that they are helpful to build **credibility**
- Credibility affects the degree to which the public believes central bank announcements
- This in turn affects the degree to which the central bank can affect the public's expectations π^e
- Ultimately, it affects how well monetary policy works

Central Bank Credibility Example

- Assume that the central bank commits to a constant price level by maintaining M^s fixed
- If firms raise prices and $P \uparrow$, real money supply and LM shift to the left
- This causes a recession, $Y \downarrow$
- If firms believe the Fed is "weak" and will respond by expanding money supply to fight the recession, then they will go ahead and raise prices
- If firms believe the Fed is "strong" and fully committed to price level stability, they understand that the Fed will do nothing and eventually the price level will have to fall anyway to restore full employment
- This "strong stance" comes at the cost of a recession that could have been avoided by expanding money supply
- If the Fed is credible, firms won't raise prices to begin with

Rules, Commitment, and Credibility

How does the central bank gain credibility?

- It can build a reputation of carrying out its promises: commit to price level stability even if that is occasionally painful (i.e. implies recessions that could be avoided by relenting on its commitment)
- This can be quite costly and may take a long time
- A less costly way to gain credibility is by following a rule that can be enforced by some outside agency
- Keynesians argue that there is a trade-off between credibility and flexibility
  - To be credible, the rule must be nearly impossible to change
  - But unbreakable rules can be very costly in a new crisis situation
  - So rules can be risky

The Taylor Rule

- The best known monetary policy rule was introduced by John Taylor in 1993
- The Taylor rule prescribes how the Fed should set its interest rate target depending on the state of the economy

$$i = \pi + 0.02 + 0.5y + 0.5(\pi - 0.02)$$

where

- i is the fed funds rate
- π is YoY inflation rate
- y is the % deviation of output from its full-employment level
- 0.02 is the target for the economy's long-run real rate

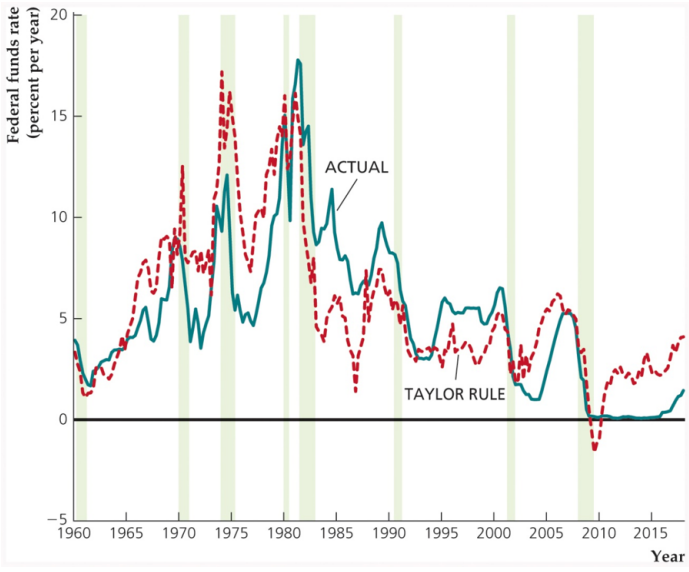
The Taylor Rule

- Alternatively, we can write it in terms of the real rate

$$r = 0.02 + 0.5y + 0.5(\pi - 0.02)$$

- The real rate has a target level of 2% and should respond to deviations of output and inflation from their targets
- Monetary policy should tighten whenever output goes above potential or when inflation goes above 2%
- Taylor showed that this rule described actual Fed behavior in practice

The Taylor Rule



The Taylor Rule

- Taylor even suggested that Congress should force the Fed to follow the rule and justify any deviations from it
- This would pose some challenges
  - Requires measuring output and inflation with no error or lags
  - Requires being able to accurately measure potential output and the output gap
- Economists have "fine-tuned" the Taylor Rule
  - Formulated in terms of forecasts as opposed to real-time gaps
  - Different coefficients on output and inflation
  - Adding persistence, such as a lagged policy rate term

$$i_t = \rho i_{t-1} + (1-\rho)[\pi_t + r_t^* + +\phi_\pi(\pi_t - \bar{\pi}) + \phi_y y_t]$$

Other ways of building credibility

- Enhance its reputation as an inflation fighter
- Hawks vs. Doves
- Appointing a Hawk to lead the central bank, someone with a strong anti-inflation stance
  - Paul Volcker's appointment in 1979
  - Greenspan continued Volcker's anti-inflation stance
  - This helped build the Fed's reputation
- The Bundesbank, Germany's central bank, has traditionally been extremely averse to inflation
  - The ECB inherited this, partly
  - One reason why the ECB's HQ was located in Frankfurt
  - "Not all Germans believe in God, but they all believe in the Bundesbank"