Monetary Policy and the Federal Reserve System

Econ 4021, Washington University in St. Louis

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

April 2023

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 considered 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 Control in the United States
3. Monetary Policy Targets
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 (banks and S&L associations) 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
- But the same analysis applies to almost any central bank in advanced market economies

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
- The sum of reserve deposits and currency is called the **monetary base**
- Also known as high-powered money, or *MB*

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
- These assets are used to satisfy deposit withdrawals or other liquidity shortfalls
- Banks did not earn any interest on reserves until 2008
- The Fed started paying interest on reserve deposits in 2008

Bank Reserves

- Banks can use the money that is lent to them as deposits to invest in (i) loans and (ii) reserve deposits
- Loans are riskier as they may default, but they also 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
- 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

Open Market Operations

- The Fed changes the money supply via **open market operations**
- It does so by purchasing/selling securities from the public, i.e. 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 that 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
- 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 (people and banks) plus deposits at banks

$$M = CU + DEP$$

- The monetary base is equal to currency held by the public plus bank reserves

$$BASE = CU + RES$$

- 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 by bank's optimal allocation of their own assets
- We can then rewrite the expression for money supply as

The Money Multiplier

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

- 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`.

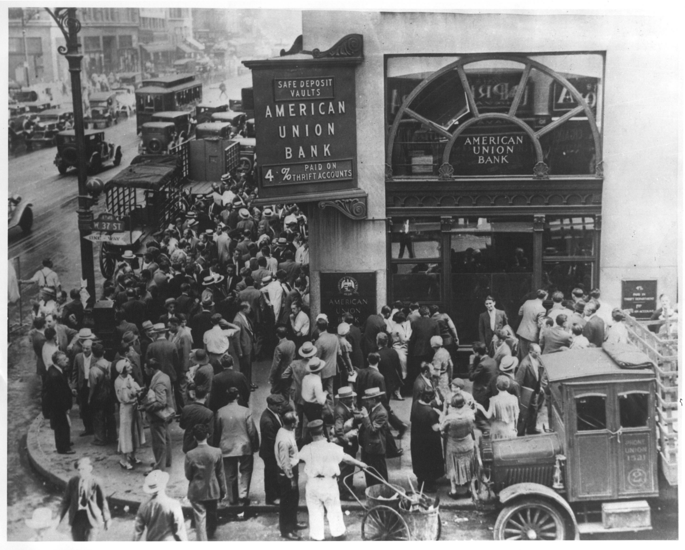
Bank Runs

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
- The seminal analysis of bank runs is by Douglas Diamond and Philip Dybvig

The Diamond-Dybvig Model

- 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 $r < 1$ 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

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 run, everybody gets the liquidation value r
- We can summarize the game in a payoff matrix:

		Everyone else	
		Keep	Withdraw
You	Keep	R	0
	Withdraw	1	r

The Diamond-Dybvig Model

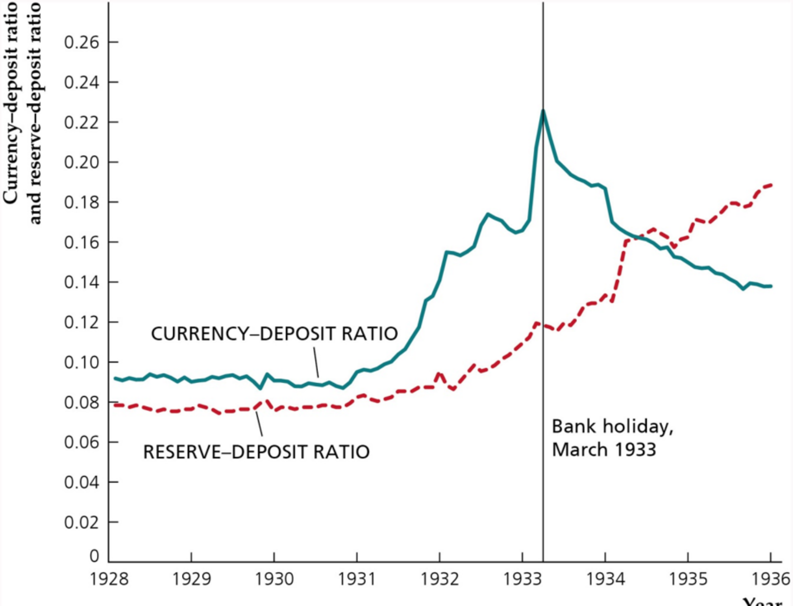
		Everyone else: Keep	Everyone else: Withdraw
You	Keep	R	0
	Withdraw	1	r

- 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 in case of a run
- Then "Keep" becomes a best response when everybody else withdraws

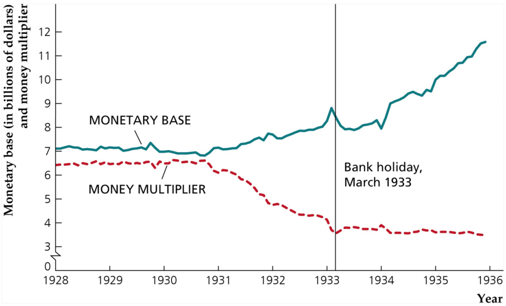
The Money Multiplier during the Great Depression

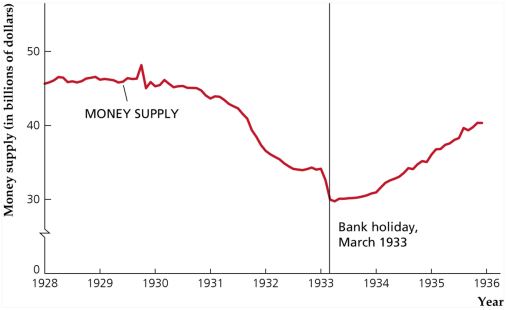
- Milton Friedman and Anna Schwartz collected data on the money supply and relevant ratios during the Great Depression
- Many factors conspired to start a banking panic in 1930
  1. Falling agricultural prices disrupted Midwestern state economies
  2. The failure of the (private) Bank of the United States 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

The Money Multiplier during the Great Depression



The Money Multiplier during the Great Depression

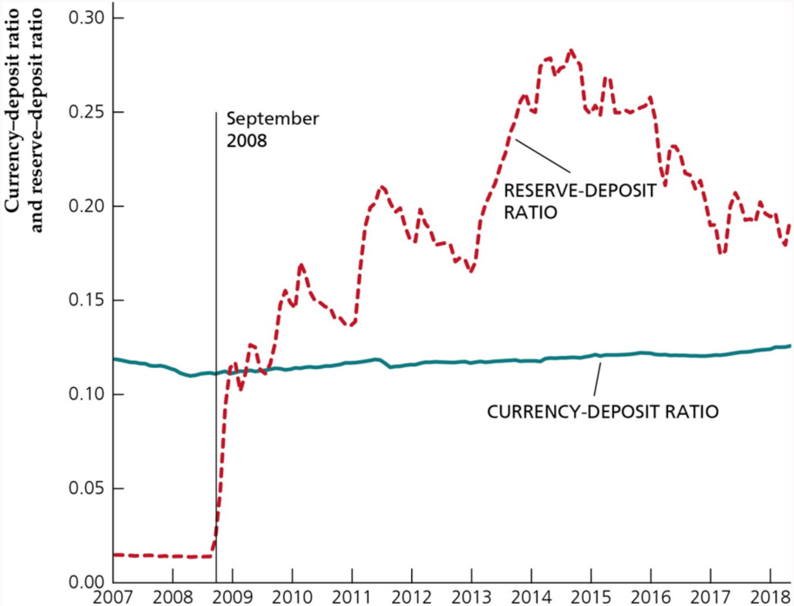




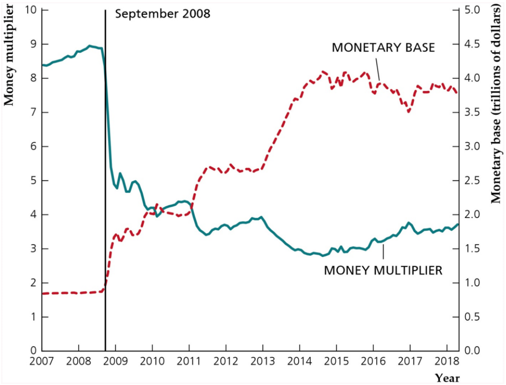
The Money Multiplier during the Great Recession

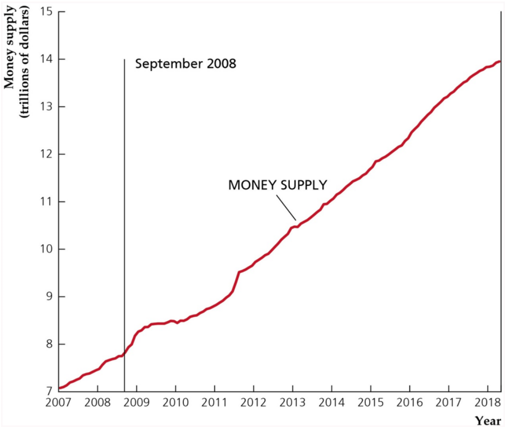
- During the 2007-08 financial crisis the existence of the FDIC prevented cu from rising
- Instead, investors sold stocks and bonds and deposited the proceeds in banks, thus $cu \downarrow$
- As in the Great Depression, banks chose to greatly expand the amount of reserves, $res \uparrow$
- Why was this?
  - 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

The Money Multiplier during the Great Recession



The Money Multiplier during the Great Recession



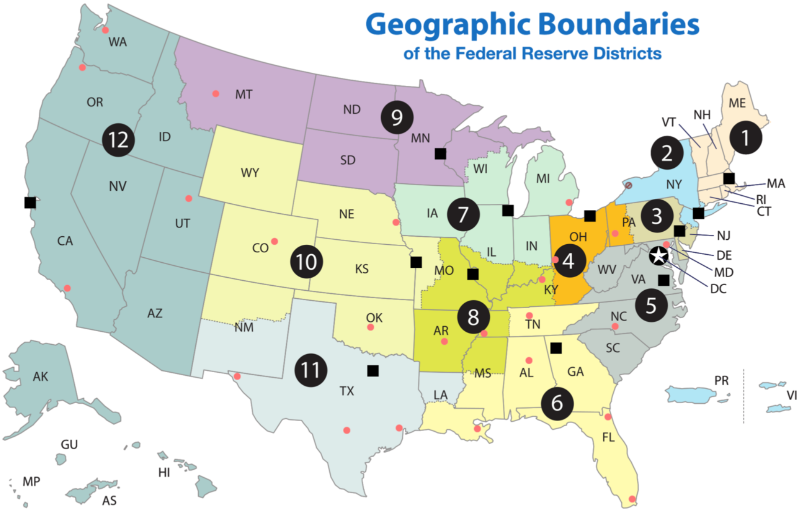


2. Monetary Control in the United States

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.
   - Seven 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
   - Seven 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 press conferences 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's conventional monetary policy tools include the following:

- Open market operations and balance sheet policy
- Reserve requirements
- Discount window lending
- Interest on reserves

The Balance Sheet of the Fed (as of 1/6/2022)

Federal Reserve System, billions of USD

Assets		Liabilities	
Gold	$ 11.0	Currency (Federal Reserve notes)	$ 2,299.0
Loans to depository institutions	$ 15.2	Reverse repo	$ 2,547.8
U.S. Treasury Securities	$ 5,456.4	Deposits of depository institutions	$ 3,116.8
Federal Agency Debt	$ 2.3	U.S. Treasury General Account	$ 346.4
Mortgage-backed securities	$ 2,641.4	Other liabilities and Net Worth	$ 248.6
Other securities	$ 285.4		
COVID lending facilities	$ 30.2		
Other assets	$ 116.7		
Total Assets	$ 8,558.6	**Total Liabilities and Net Worth**	$ 8,558.6

Balance sheet as of January 11, 2023

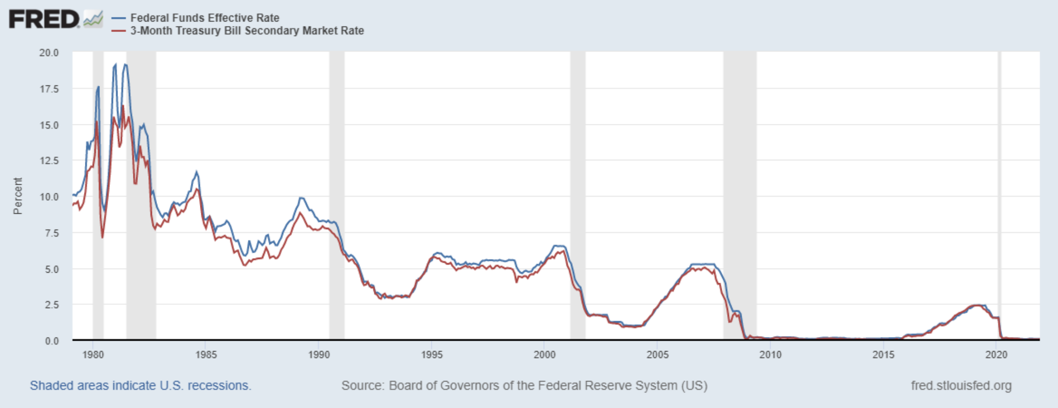
The Balance Sheet of the Fed

- The monetary base is equal to currency plus reserve deposits
- The monetary base was equal to $ 5,415 bn as of 1/11/2023
- 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

- When the Fed conducts OMOs, this affects the market for reserves
- This is the market at which banks lend and borrow reserved from each other at the end of each business day
- Banks do this to ensure that they meet regulatory requirements such as reserve requirements
- The interest rate at which banks lend to each other in this market is the **federal funds rate** (aka fed funds rate)
- It is one of the shortest-horizon interest rates in the economy and a key policy target for the Fed

The Federal Funds Rate



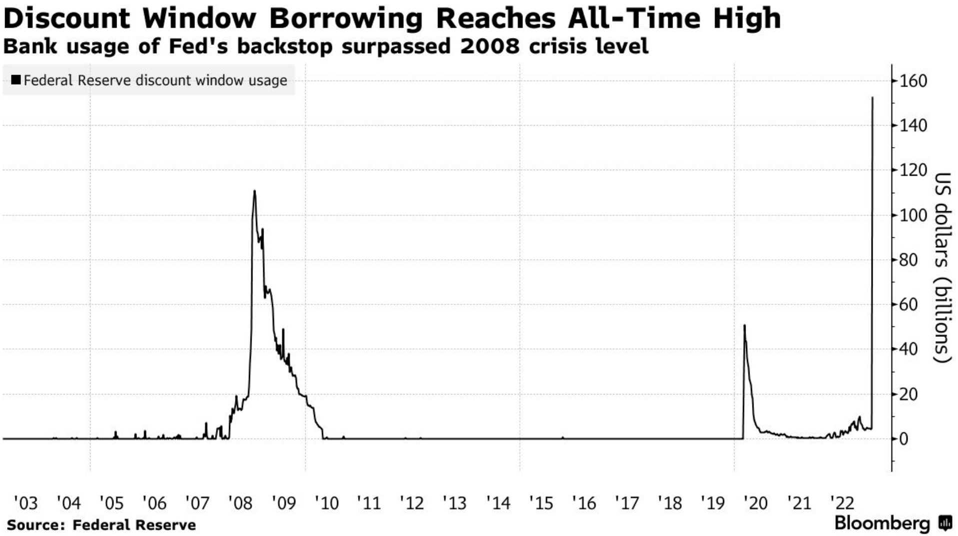
Reserve Requirements

- Another monetary policy tool controlled by the Fed are reserve requirements
- These are the minimum $res = \frac{RES}{DEP}$ reserve-deposit ratios that banks must satisfy at all times
- By changing this requirement, the Fed could affect money supply and the money multiplier
- In practice, this tool has been rarely used in the US
  - Other regulatory ratios are tighter
  - Since the Fed started paying interest on reserves, most banks voluntarily hold reserves
- In March 2020, the Fed set the reserve requirement to be 0%
  - But is actively used by central banks in other countries
  - It is an important monetary policy tool in China

Discount Window Lending

- One of the main reasons the Fed was created was to act as a "lender of last resort"
- i.e., someone who would stand read to lend to banks who needed liquidity to satisfy deposit withdrawals or reserve requirements
- The Fed performs this function through the **discount window**, at which it lends to banks at a **discount rate**
- This rate is higher than other interest rates to discourage its use during normal times
- When the Fed lends \$100 in reserves through the discount window:
  - The assets of the Fed rise by \$100 (loans category)
  - The liabilities of the Fed rise by \$100 (reserves of the borrowing bank)
- This raises the monetary base

Discount Window Borrowing



Interest on Reserves

- The Fed began paying interest on reserves in 2008
- Banks were spending too many resources trying to minimize the amount of reserves
  - Reserves earned zero interest, and banks could have used those funds to purchase interest-bearing assets instead
- This greatly expanded banks' holding of reserves, to the point that reserve requirements stopped binding
- It also gave another policy tool
  - If the Fed raises the interets rate in reserves, banks prefer holding reserves to making loans, thus $res \uparrow$ and the money supply shrinks
  - If the Fed wants to expand the money supply, it lowers the interest rate on reserves so that banks prefer to make loans and $res \downarrow$

Factors Affecting the Monetary Base and the Money Multiplier

Factors Affecting the Monetary Base, the Money Multiplier, and the Money Supply

Factor	Effect on monetary base, *BASE*	Effect on money multiplier, $(cu + 1)/(cu + res)$	Effect on money supply, *M*
An increase in the reserve–deposit ratio, *res*	Unchanged	Decrease	Decrease
An increase in the currency–deposit ratio, *cu*	Unchanged	Decrease	Decrease
An open-market purchase	Increase	Unchanged	Increase
An open-market sale	Decrease	Unchanged	Decrease
An increase in reserve requirements	Unchanged	Decrease	Decrease
An increase in discount window borrowing	Increase	Unchanged	Increase
An increase in the discount rate	Decrease	Unchanged	Decrease
An increase in the interest rate paid on reserves	Unchanged	Decrease	Decrease

Note: The relationship among the money supply, the money multiplier, and the monetary base is $M = [(cu + 1)/(cu + res)]BASE$.

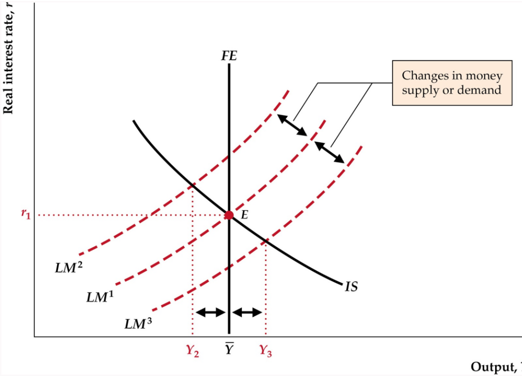
3. Monetary Policy Targets

Intermediate Targets

- We have looked at the instruments that the Fed uses to conduct monetary policy
- Ultimately, the Fed wants to affect economic activity: employment and prices, but the Fed does not directly control those
- 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 Fed Funds Rate

Intermediate Targets

- The Fed cannot target simultaneously target money supply and the fed funds rate
- 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 years, the Fed has mostly targeted the Fed Funds rate



Targeting the Fed Funds Rate

- Targeting the Fed Funds rate works well to stabilize the economy if most shocks are to the LM curve

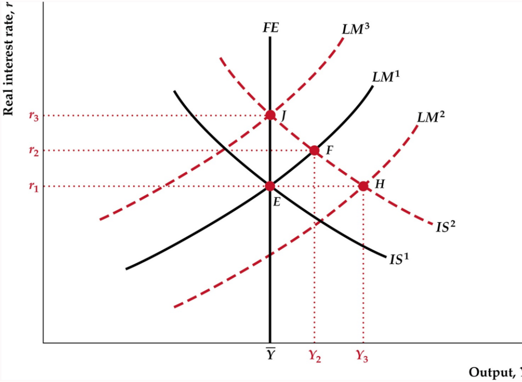
- Then the Fed can simply adjust M^s to expand or contract the LM so as to maintain full-employment $\bar{Y}$ *and* its interest rate target r_1

- But a constant interest rate target causes problems if the economy is subject to other types of shocks

Targeting the Fed Funds Rate

Consider a positive shock to the *IS* curve

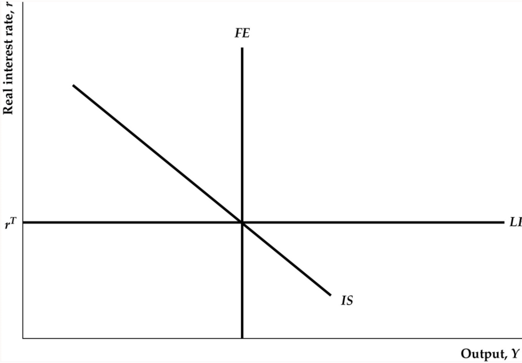
- If the Fed wants to keep r_1 constant, it needs to expand M^s to make *LM* shift to the right
- This makes output increase even more, and will eventually result in a larger price increase
- The only way to keep output close to potential and prevent prices from rising is to raise $r_1 \uparrow r_3$
- 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 also known as the $IS - MP$ model



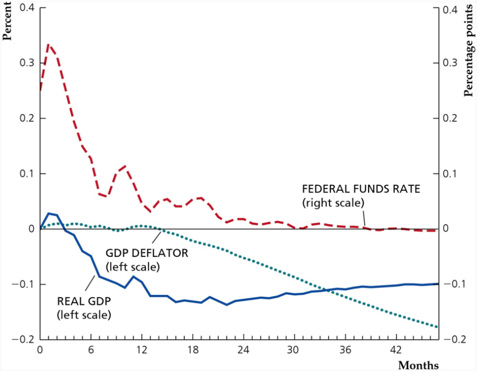
4. Monetary Policy in Practice

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

Monetary Policy in 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

Monetary Policy in the Great Recession

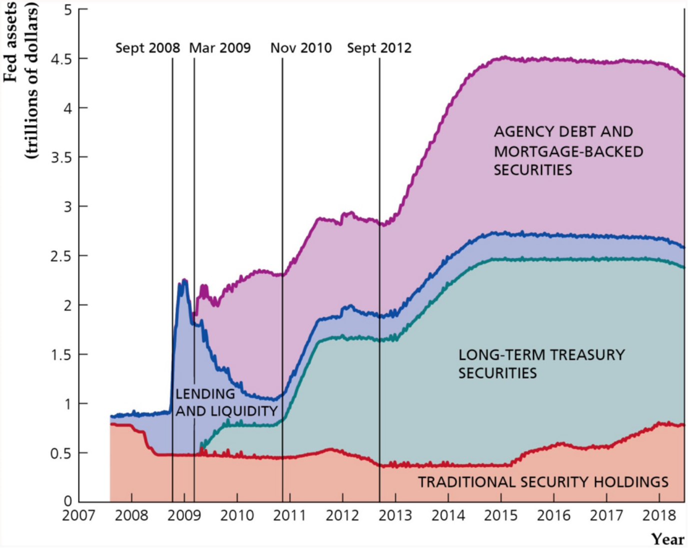
- As the economy started entering a recession in 2008, the Fed lowered interest rates
- By the end of 2008, the Fed had cut interest rates to near zero
- The economy was in a **liquidity trap**: a situation in which further expansions of money supply have no effect on interest rates and therefore on 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



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
  - 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%"
- 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

The Taylor Rule

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

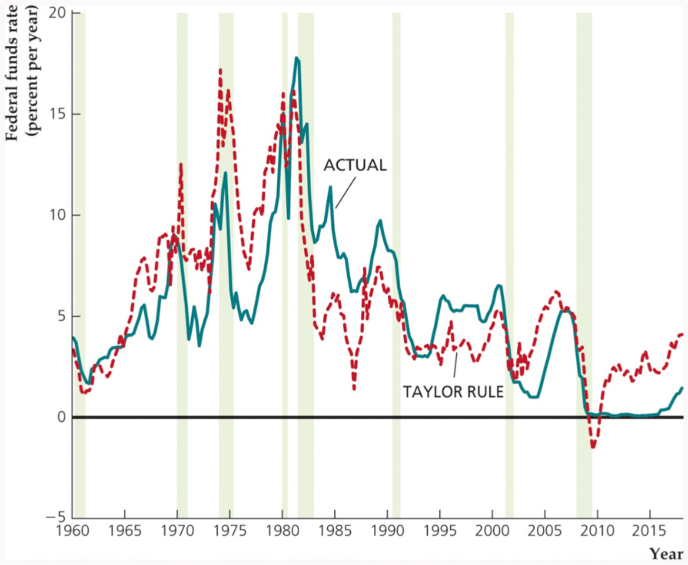
$$r = 0.02 + 0.5y + 0.5(\pi - 0.02)$$

- 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 has 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

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

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 reasons why the ECB's HQ was located in Frankfurt
  - "Not all Germans believe in God, but they all believe in the Bundesbank"