

Module 2: The Federal Reserve

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Lesson 2-1: The Federal Reserve

Lesson 2-1.0: Overview

Module overview

- Federal Reserve System
- History, organization, purpose
- Monetary policy tools

Hello and welcome. I hope you're doing well from wherever it is you're joining us. In this module, we study the Federal Reserve System, its functions and its monetary policy tools. We start with the history of the Federal Reserve. Why do we have a central bank? How is it organized? What purpose does it serve? We will take a careful look at two goals of monetary policy: maximum employment and stable prices. This is often called the Dual Mandate of the Federal Reserve. For all of our discussion for the remainder of this course should somehow relate back to the Dual Mandate. We will then examine the institutional features of the Federal Reserve and see how its monetary policy decision-making process works. To be clear, this course examines the Federal Reserve System of the United States as a case study. There are, of course, many other central banks around the world. Some central banks have a different mandate or a slightly different set of key functions. However, all of them conduct monetary policy and provide a payment system. In this course, we focus mostly on how central banks conduct monetary policy. Over time, there has been much disagreement about the best ways to conduct monetary policy. Some central banks explicitly target the money supply rather than interest rates. The Federal Reserve used to do this.



Traditional monetary policy

- Price of money = interest rate
- Target money supply?

Why do we care about money supply? Like any other good, the price of money is determined by demand for money and supply of money in the economy. What's perhaps unusual is that the price of money is the interest rate. Rather than targeting interest rates directly, it might make sense to control the money supply, instead. But that begs the question, how can we measure the money supply? We will therefore introduce the concept of money supply, its measurement, and how it can be affected by monetary policy. We then examine the balance sheet of the Federal Reserve and how it has evolved over time. We will provide some insights about how the conduct of monetary policy has changed money supply.

Traditional monetary policy

- Price of money = interest rate
- Target money supply?
- Target interest rates directly?
 - Equilibrium in Fed Funds market
 - Open market operations

To understand how exactly money supply and interest rates are related, we will focus on traditional monetary policy. We will discuss how open market operations directly affect the money supply in the federal funds market. We will see how these open market operations determine the equilibrium interest rate in this market. The Federal funds rate. The Federal funds rate is the main target interest rate of monetary policy in the US. A complimentary traditional monetary policy tool is the discount window. This policy tool provides short-term liquidity in form of short-term loans to banks. This tool is mainly designed for emergency uses so the interest rate is set higher than the Federal funds rate. But the discount window loans remain an alternative to Federal funds. The interest rate on the discount window loans, therefore, enforces the upper limit of the Federal funds rate target range set by the Federal Reserve.

New approaches

- Forward guidance
- Large-scale asset purchases
- Equilibrium in repo market

The last part of this module looks at new monetary policy tools that have emerged after the 2008 global financial crisis. These are often called unconventional monetary policy tools. The first is forward guidance. Forward guidance gives market participants a clear path for interest rates, or more generally, monetary policy actions in the future and can be used to target long-term interest rates. The second new tool are large-scale asset purchases. When the short-term interest rate is already zero, central banks can further increase the money supply by buying large amounts of government-backed debt such as Treasury securities and agency mortgage-backed securities. This approach allows the Central Bank to bring down long-term interest rates directly. The third new tool is the Overnight Reverse Repurchase Program or ORRP. This tool is used to set interest rates in the repo market. The repo market is like the federal funds market and overnight lending market. Financial institutions could switch between these markets. They are substitutes. By managing the equilibrium in the repo market, the Federal Reserve ensures that all short-term interest rates are consistent with their monetary policy targets.

To conclude, this module provides an in-depth discussion of monetary policy tool. Many of these videos will require an understanding of the financial markets and instruments discussed in the first module. Specifically the federal funds market, the repo market, Treasury securities, and the yield curve. You don't need to understand all the technical details of each monetary policy tool. However, I do want you to keep these two main high-level points in mind. First, the Federal Reserve targets multiple closely linked markets with its interest rate policy. Second, when the short-term interest rate is zero, the central bank is not out of options. It can use forward guidance and large-scale asset purchases to target longer-term interest rates.

[Lesson 2-1.1: History and Structure of the Federal Reserve](#)

Learning Objectives

- Why central banks?
- Federal Reserve System:
The United States Central Bank

Hello and welcome to this lecture on the history and structure of the Federal Reserve System. In this class we will discuss the reasons why central banks around the world were founded. We will then focus on the foundation of the Federal Reserve System, the US Central Bank. We will examine the structure of the Federal Reserve System and its main decision making bodies. To understand why countries founded central banks, let's start by looking at the events leading to the foundation of the world's oldest central bank, the Swedish Riksbank.



In 1661, the Swedish king had allowed the first private Swedish bank, the Stockholms Banco to manage money with bank notes rather than metal coins. Banknotes were preferable to heavy metal coins that weighed up to 45 pounds.

Swedish Riksbank

- Private paper money
- Backed by precious metal
- Redeemable

Why were people failing to accept these bank notes? Because the Stockholms Banco promised to exchange its banknotes against coins deposited in the bank on demand. The banknotes were a huge success. But then the bank printed more and more banknotes.



The rapid increase in banknotes, led people to question, whether the Stockholm Banco would have enough coins deposited in its walls to exchange all the banknotes.

Swedish Riksbank

- Printing more money
- Devaluation of money
- Run on the bank

The value of the notes dropped and eventually an increasing number of people redeemed the banknotes for coins. This is an example of a bank run. The bank however, did not have enough coins to redeem all its banknotes and collapsed. Despite this bankrupt, the Swedish nobility still like the idea of paper money. But they

understood that the core problem was that the Stockholms Banco, had issued too much paper money relative to its collateral the deposited coins.



Hence, when the Swedish Riksbank was founded in 1668, the law required it to maintain the domestic coinage at its right and fair value.

Swedish Riksbank

- Stable ratio of money to collateral
- Limit paper money to limit inflation

That is, the law prohibited the Riksbank to print paper money at volumes that would

cause inflation. The story of the foundation of the Swedish Riksbank showcases two important issues, that modern central banks are designed to address.

Reasons for Central Banks

1. Maintain price stability
2. Lender of last resort

The first one is ensuring price stability. Central banks are typically given control over the money supply. This control allows central banks to prevent too much paper money being printed and keep inflation in check. The second one is that banks are susceptible to runs and need a lender of last resort. Banks are short term and lend long term. In our example, Stockholms Banco borrowed coins by issuing bank notes. And then it used the coins in part to give out loans. So at any point, there were less coins in the vault than banknotes outstanding. When everybody wanted coins for the banknotes, the bank like the coins, or more generally cash. The lender of last resort function of central banks, is designed to prevent the collapse of a sovereign bank.

Lender of Last Resort

1. Provides cash
2. Accepts illiquid assets

The central bank provides cash to the banks in form of short term loans against collateral. Central banks typically accept different often illiquid assets. That is assets that would be hard to sell or can only be sold with large discounts as collateral for short term loans. For instance, today the Federal Reserve System accepts real estate and consumer loans, as collateral for cash loans to banks. Let's now look at the reasons for the foundation of the Federal Reserve System.

Federal Reserve System

- Third U.S. central bank
- Severe banking crises in 19th century
- Panic of 1907

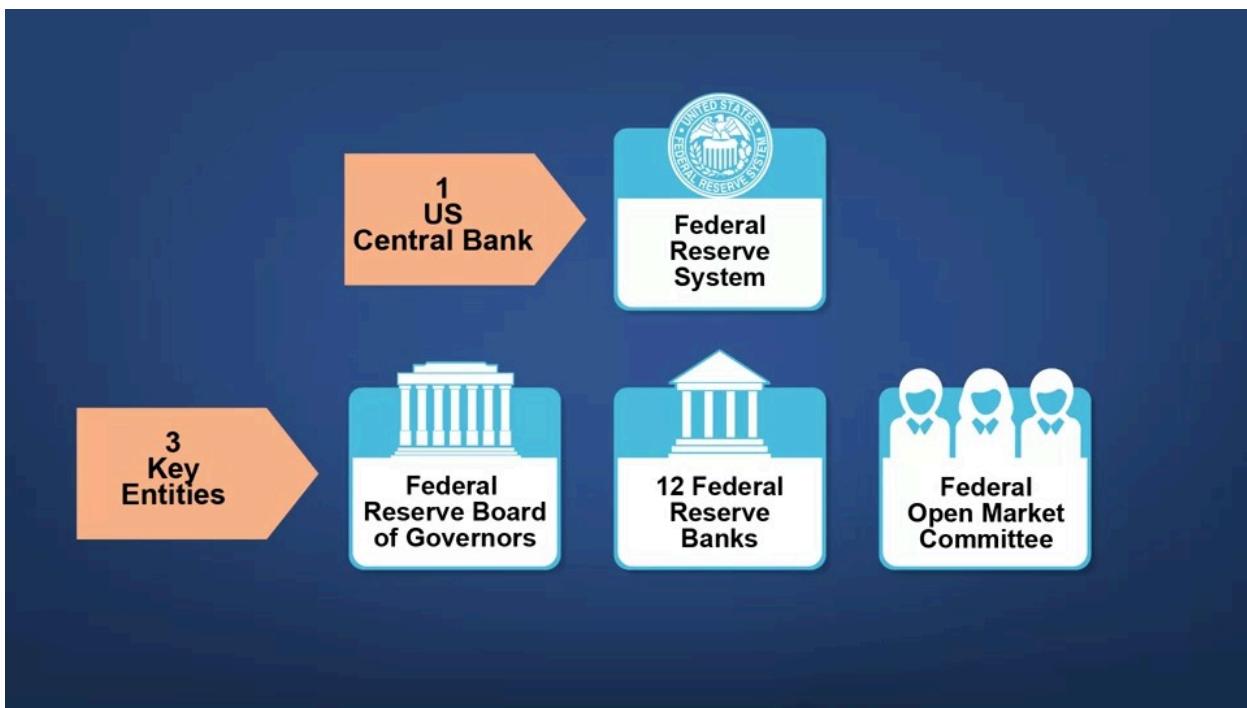
The Federal Reserve System is not the first U.S. central bank. There was the first Bank

of America from 1791 to 1811 and the second Bank of America from 1816 to 1836. But both were very different from what we today would consider to be a central bank. For instance, they had no control over the money supply. The United States had no central bank between 1837 and 1913. Money was issued privately, just like in our Swedish example. In this period, several banking crisis occurred. Then in 1908, the collapse of the third largest New York bank, the Knickerbocker Trust, sparked a banking panic. The stock market lost 50% of its value. Banks nationwide, so customers lining up to withdraw the deposit. The panic of 1907 illustrated the need for lender of last resort in the United States. But it took some time and much political debate until the Federal Reserve System was officially established.

Federal Reserve System

- Federal Reserve System established in 1913
- Control of money supply

On December 24, 1913, President Woodrow Wilson signed the Federal Reserve Act. The Act gave the Federal Reserve System control over the money supply and set it up as a lender of last resort to banks. The lender of last resort function established in section 13 of the Federal Reserve Act, has been used for interventions during the 2008 financial crisis and during the COVID-19 pandemic.

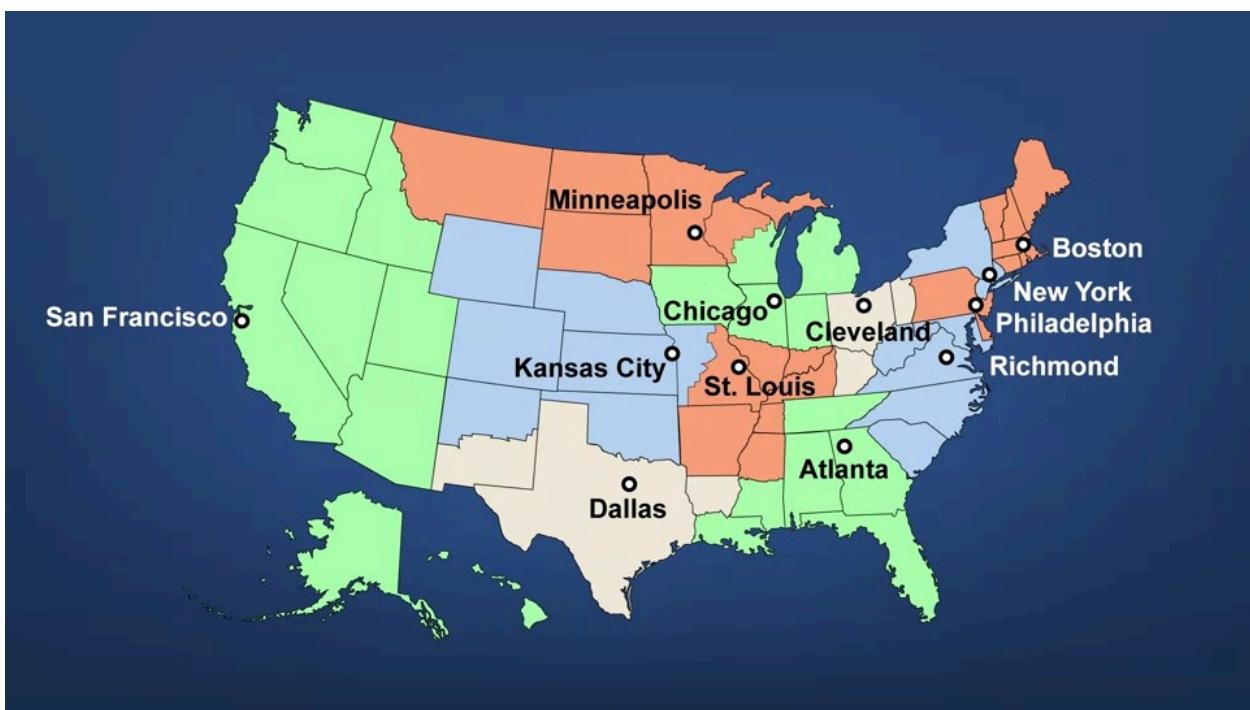


The Federal Reserve Act establishes three parts of the US central bank. One independent Federal Agency, the Board of Governors in Washington DC, 12 Regional Federal Reserve Banks and the Federal Open Market Committee, or FOMC.

Board of Governors

- Seven governors
- Guides policies

The Board of Governors consists of seven members, the Board of Governors guides the policies of the Federal Reserve System.



The 12 Regional Federal Reserve Banks are Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas and San Francisco. The Reserve Federal Reserve Banks were placed across important financial centers, in part as a counterweight to the by far largest financial center New York city. The reserve banks implement the Federal Reserve policies and functions. For instance, they examined and supervise financial institutions, act as lender of last resorts to the banks in their districts, and provide US payment services. The seven members of the Board of Governors, the president of the Federal Reserve Bank of New York and a rotating group of the remaining Federal Reserve Bank presidents, formed the FOMC.

FOMC

- 12 members
- Sets interest rates
- Can intervene in foreign exchange markets

The FOMC decides on Open market operations that set interest rate targets. Less known, is that the FOMC can also direct operations in foreign exchange markets. As an example during the 2008 financial crisis and the COVID-19 pandemic. The FOMC authorized currencies for programs with foreign central banks to ensure that US dollars would be widely available across the globe.

Summary

- Central banks founded to stabilize money and banking system
- Central banks control money supply
- Central banks act as lender of last resort
- Federal Reserve System of the United States:
 1. Board of governors
 2. 12 Reserve banks
 3. FOMC

What have we learned in this lesson? Before central banks existed, paper money was often issued privately. In this system, the money supply was unpredictable and

bankrupts occurred frequently. To stabilize the money supply and the banking system, central banks were founded. Central banks control the money supply, limiting inflation. Central banks are also the lender of last resort that will lend cash to banks in times of crisis. In the United States, the Federal Reserve System fulfills these functions through three entities, the Board of Governors, 12 Federal Reserve Banks and the Federal Open Market Committee.

Lesson 2-1.2: Five Key Function of the Federal Reserve System

Learning Objectives

- Monetary policy
- Financial stability
- Regulation
- Payment system
- Consumer protection

Hello and welcome to this lecture on the five key functions of the Federal Reserve System. In this class, we will discuss the Federal Reserve's mandate to conduct monetary policy, promote financial system stability, regulate and supervise financial institutions, provide an efficient payment system, and to promote consumer protection and community development. The Federal Reserve System was established after the financial crisis of 1908. The Federal Reserve Act of 1913 that created the Federal Reserve System, intended that monetary policy should foster a productive and stable US economy. The Federal Reserve Act, therefore, specified that the Federal Reserve should conduct monetary policy so as to promote effectively the goal of maximum employment, stable prices, and moderate long-term interest rates.

Monetary Policy

- Maximum employment

Let's unpack this statement. Maximum employment usually refers to a situation when most people who are looking for work are gainfully employed. It is easy to see that staple economic growth and maximum employment are linked. However, consider what happens when the unemployment rate is really low. Workers are harder to find and hence wages go up. Higher wages mean higher production costs and ultimately higher prices. It is hard to fix a precise unemployment rate that would mean that maximum employment was achieved.

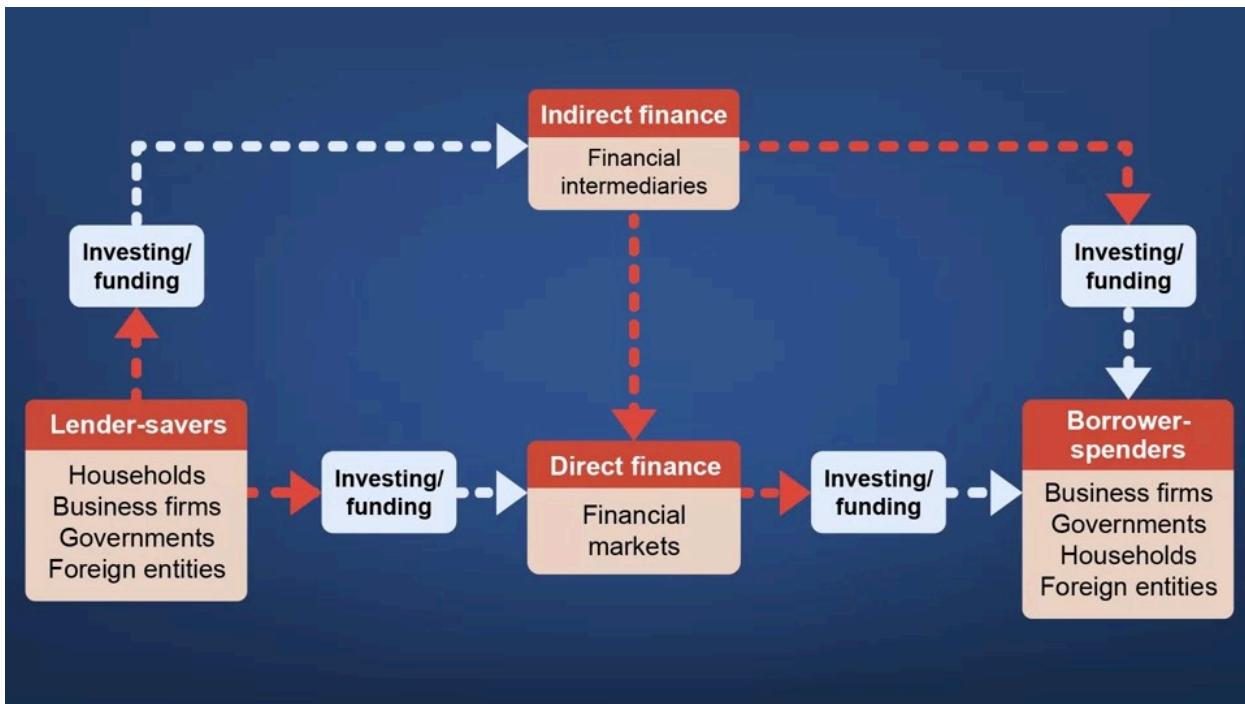
Monetary Policy

- Stable prices

Why are stable prices so important for stable economic growth? Stable prices encourage savings and capital formation. When inflation is high, asset values erode. This, in turn, reduces households' incentives to save and businesses' incentives to invest. The Federal Reserve considers an inflation rate of 2% as consistent with its long-run goal. In the wake of the COVID-19 crisis, policymakers have pointed out that they consider an average inflation rate of 2% to be the target. This means that they are willing to accept higher inflation in the short run. Similarly, moderate long-term interest rates increase businesses' incentives to invest.

Financial Stability

The second key function is financial stability. What is financial stability? Generally, we consider a financial system to be stable when financial markets are able to provide services to households and businesses without interruptions.



That is, the financial institutions efficiently intermediate funds between savers and borrowers, and by doing so, efficiently allocate capital across the economy. While financial stability was always a concern for the Federal Reserve, the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, assign the Federal Reserve

financial system stability as responsibility. The Federal Reserve has two approaches to fulfill these responsibilities.

Federal Reserve

- Micro-prudential approach
- Macro-prudential approach

First, a so-called micro-prudential approach that focuses on specific institutions. Second, a so-called macro-prudential approach that focuses on financial system vulnerabilities. The micro-prudential approach is related to bank supervision, which we will discuss shortly. Let's focus on the macro-prudential approach. The Federal Reserve monitors several measures of financial markets stress.

Asset valuations and risk appetites

The deflation of high assets prices, like house prices in 2008, can destabilize the economy.

Financial system leverage

Unusually high leverage in financial institutions can amplify losses and lead to fire sales.

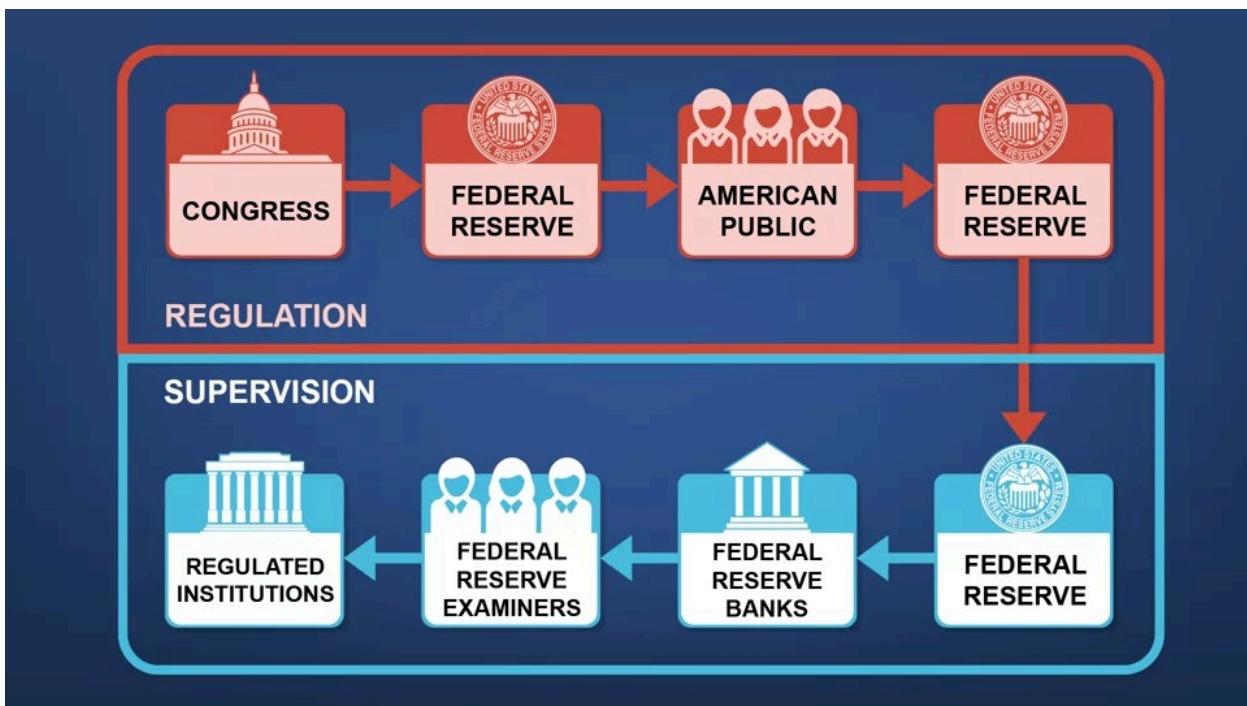
Maturity transformation

Banks and money market mutual funds borrow short-term and lend longer-term and therefore may experience “runs” that disrupt the flow of credit.

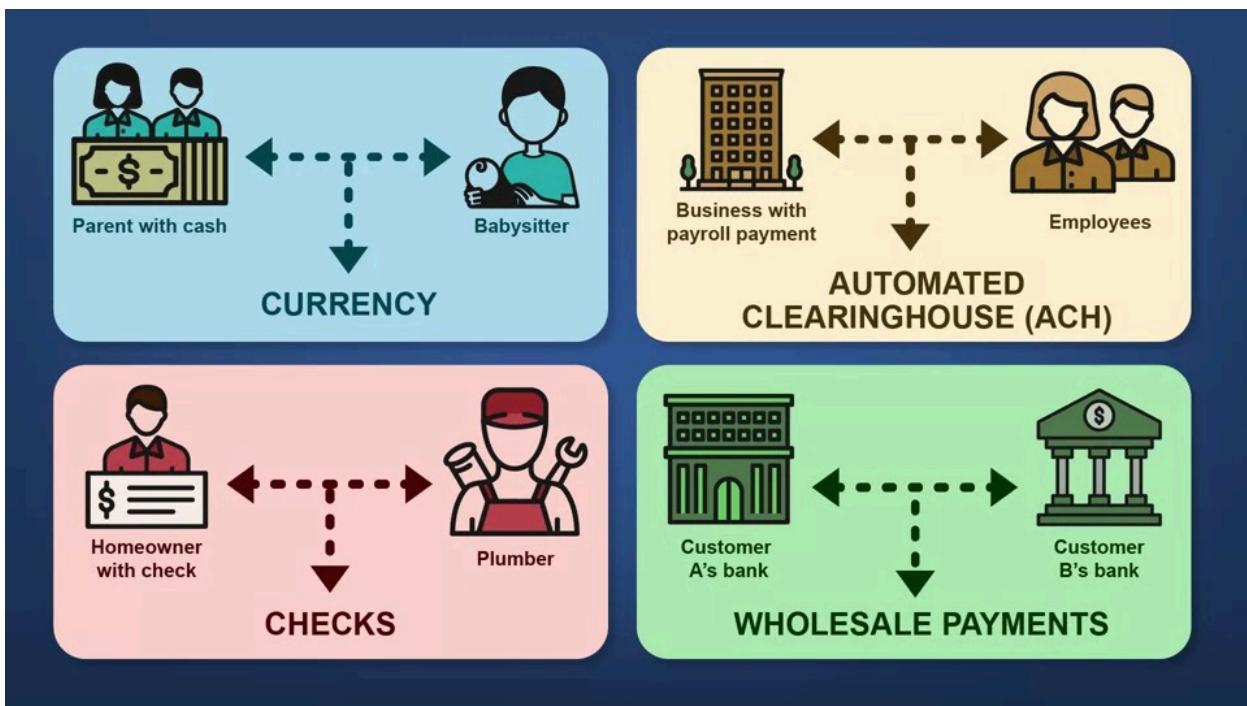
Nonfinancial sector borrowing

If households or firms take on too much debt, they will eventually cut spending and investment, which can amplify an economic downturn.

The first measure is asset valuations and risk appetites. The deflation of high asset prices, like house prices in 2008 can destabilize the economy. The second measure is financial system leverage. Unusually high leverage in financial institutions can amplify losses and can lead to fire sales. The third measure is maturity transformation. Banks and money market mutual funds for short-term and lend longer-term, and therefore may experience runs that disrupt the flow of credit. The last measure is non-financial sector borrowing. If households or firms take on too much debt, they will eventually cut spending and investment which can amplify an economic downturn. These four measures provide a broad overview of risks to financial stability. The third key function of the Federal Reserve is to regulate and supervise financial institutions. Regulation and supervision are distinct but complementary activities.



Regulation relates to the writing of rules. This process starts in Congress with legislation that gives the Federal Reserve the mandate to draft rules. This input from the public, the rules are finalized and published. Supervision relates to compliance with regulation. For this purpose, the Federal Reserve trains banks examiners. The examiners conduct online or site visits to regulated financial institutions to ensure compliance with regulation. Supervisors can impose fines and other penalties such as restrictions on dividend payments if financial institutions are violating regulations. Supervision relates to financial stability as supervision is a micro-prudential approach that ensures the safety and soundness of individual financial institutions and involves in-depth examinations and inspections. The fourth key function of the Federal Reserve is to provide an efficient payment system.



Currently, the Federal Reserve supports payments in form of currency, checks, bank transfers, and wholesale payments. The Federal Reserve issues paper money or cash that traditionally was used for many household transactions. Checks are also cleared for the Federal Reserve Banks. That is they facilitate the payments between the bank that deposits the check and the bank and which the check is drawn. The Automated Clearinghouse or ACH settles small value bank transfers like paying your utility bill. Large value transactions among businesses and banks are settled through Fedwire. Starting in 2023, a new service, FedNow will provide instant settlements.

Promoting Consumer Protection

The fifth function of the Federal Reserve is to promote consumer protection and community development. The Federal Reserve implements various consumer protection, fair lending, fair housing, and community reinvestment laws. To support the implementation, the Federal Reserve collects data, engages in research, and formulates bank supervision policies. Here are some examples. To implement the Community Reinvestment Act, the Federal Reserve collects data on how much credit flows to communities and encourages financial institutions to help to meet the credit needs of the entire community. That includes lending to low and moderate-income households.

Truth in Lending Act

- Lenders disclose lending terms and costs

Under the Truth in Lending Act, the Federal Reserve also requires lenders to disclose lending terms and costs to borrowers.

Federal Trade Commission Act

- Prohibits unfair or deceptive acts or practices

And under the Federal Trade Commission Act, prohibits unfair and deceptive acts or practices in any aspect of banking transactions.

Summary

- Functions of the Federal Reserve:
 1. Monetary policy
 2. Financial stability
 3. Regulation and supervision
 4. Offering a payments system
 5. Consumer protection

In this lecture, we have discussed the five key functions of the Federal Reserve. First, conducting monetary policy. Second, promoting financial system stability. Third, regulating and supervising financial institutions. Fourth, providing an efficient payment system, and fifth, promoting consumer protection and community development.

Lesson 2-2: Traditional Monetary Policy

Lesson 2-2.1: Money Supply

M = Money supply

V = Velocity of circulation

Total Money Supply

$M * V$

Hello and welcome to this lecture on the money supply. In this class, we will discuss what the money supply is and how it is measured. We will introduce the quantitative theory of money and the money multiplier. We will then discuss how central banks can affect the money supply. Our starting point is the quantitative theory of money, which was popularized by Milton Friedman. The theory states that the value of all goods and services has to be equal to the total supply of money. Let's look at this in more detail. The total money supply has two components. Think of money supply M as dollar notes and coins in circulation as well as bank balances. In one here, cash changes hands multiple times this is called the velocity of circulation, or V . The more often cash changes hands, the higher the velocity is. The total money supply is then M times V .

**T = Total number of transactions
of goods and services**

P = Price

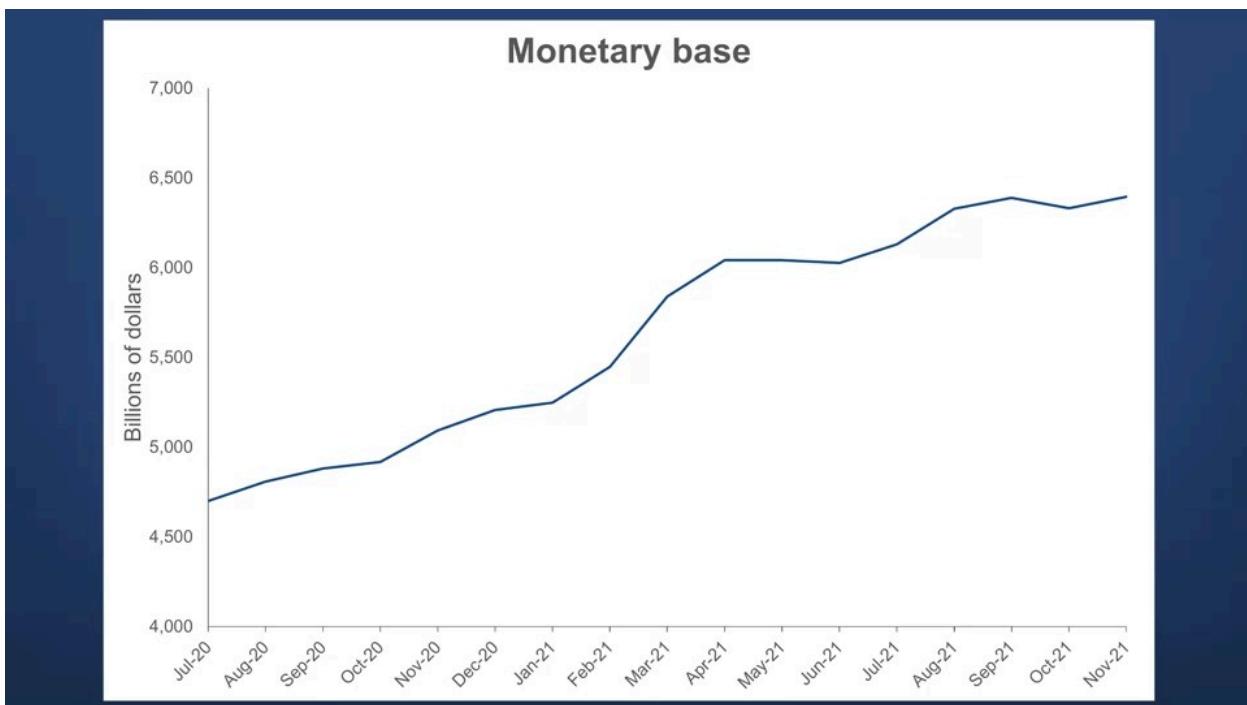
Total Expenditure
 $= P * T$

With this total money supply, we buy goods and services, let's call the total number of transactions of goods and services in a year T . And the average price per transaction P , then in a year we would have spent a total of P times T on goods and services. In other words, our total demand for money is P times T .

$$\uparrow \quad \uparrow \\ M * V = P * T$$

Equating supply and demand, we get that the total money supply M times V has to be equal to expenditure P times T . Now suppose the central bank decides to print more money and doubles the money in circulation. The velocity is usually thought of as fixed

and the production of goods and services tend to change slowly. So, prices have to go up. In this example, prices would have to double to equate money demand with money supply. This example also illustrates a more general point. Like any other commodity, the value of money declines if there's more money in circulation. How is money supply measured? The narrow definition is the monetary base.



The monetary base is the sum of currency in circulation and reserve balances. That is deposits held by banks in their accounts at the Federal Reserve.

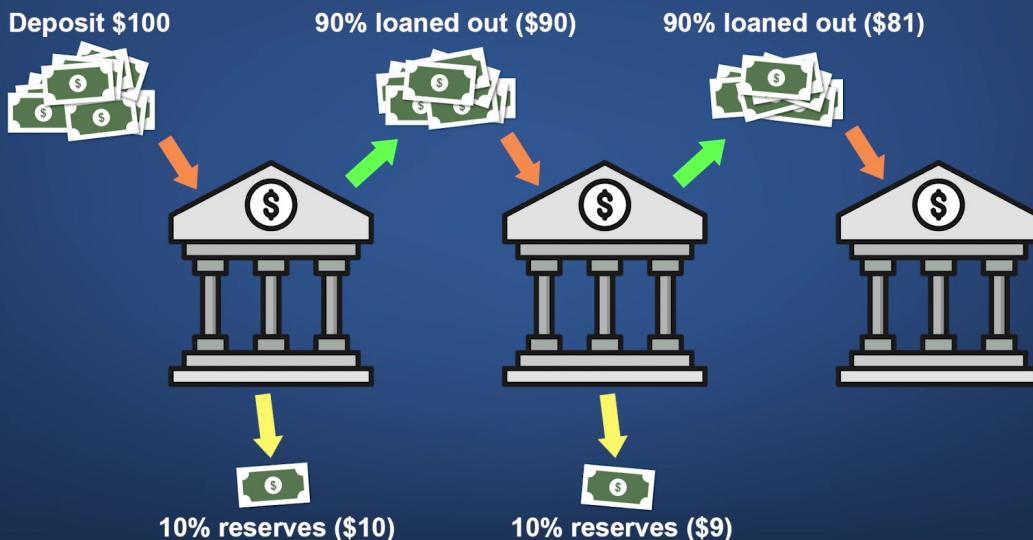
Monetary Aggregates

M1 = currency in circulation
+ reserve balances
+ checking account deposits



A somewhat wider definition of money supply is M1. M1 consists of the monetary base and the sum of currency held by the public and transaction deposits at banks. The idea of M1 is to capture cash and how much loanable funds banks have.

Money Multiplier



Why are loanable funds so important? Let's say your deposits \$100 at your bank. The bank keeps 10% or \$10 at the Federal Reserve as reserves and lends out \$90. The \$90 will appear as a new deposit in the borrowers checking account. Again, the bank keeps

10% or \$9 at the Federal Reserve as reserves and lends out \$81. Now, the \$81 will again appear as a new deposit and so on.

Money Multiplier

I

$$1 \times 100 + 0.9 \times 100 + 0.9^2 \times 100 + \dots$$

$$= \sum_{t=0}^{\infty} 0.9^t \times 100$$

$$= \frac{100}{1 - 0.9}$$

$$= 1000$$

This is an infinite series. One times 100 plus 0.9 times 100 plus 0.9 square times 100 plus 0.9 cubed, times 100, etc. This series is converging to \$100 divided by the reserve ratio, 10% reserves translate into a reserve ratio of 0.1. So, with 10% reserves, a \$100 deposit can create up to \$1,000 in total money supply.

Monetary Aggregates

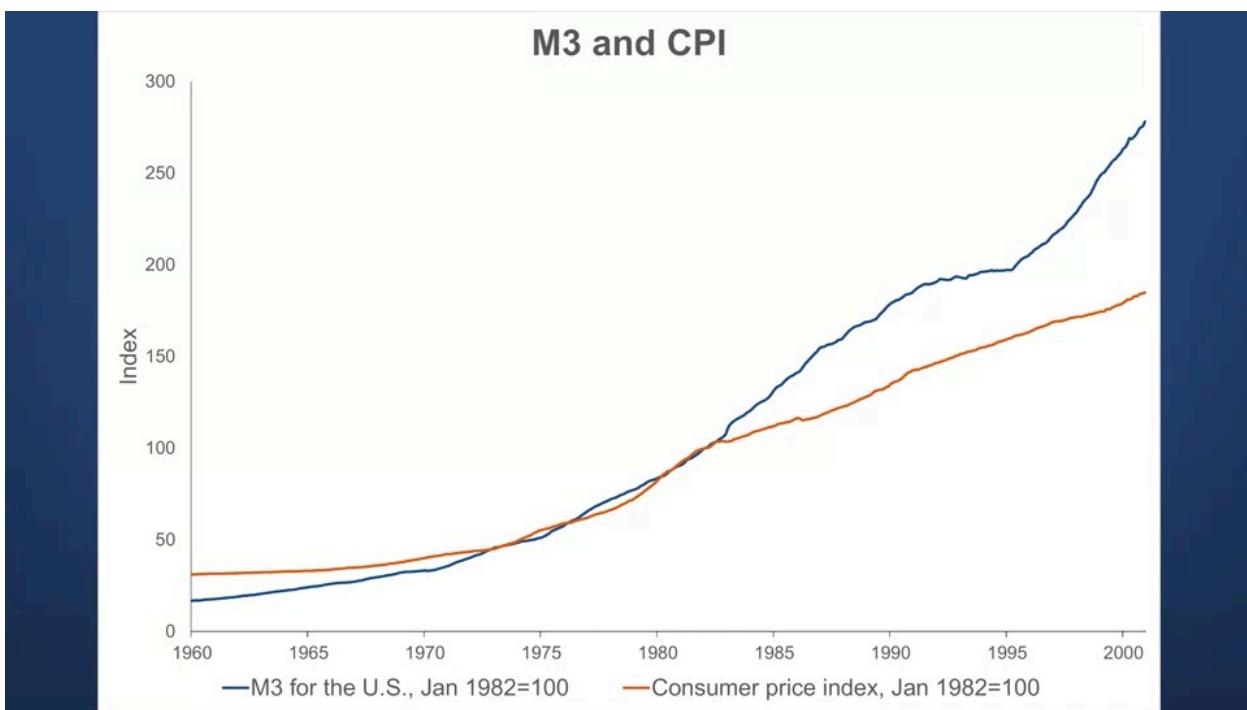
M1 = currency in circulation
+ reserve balances
+ checking account deposits

M2 = M1 + savings deposits
+ small time deposits +
retail MMMF shares

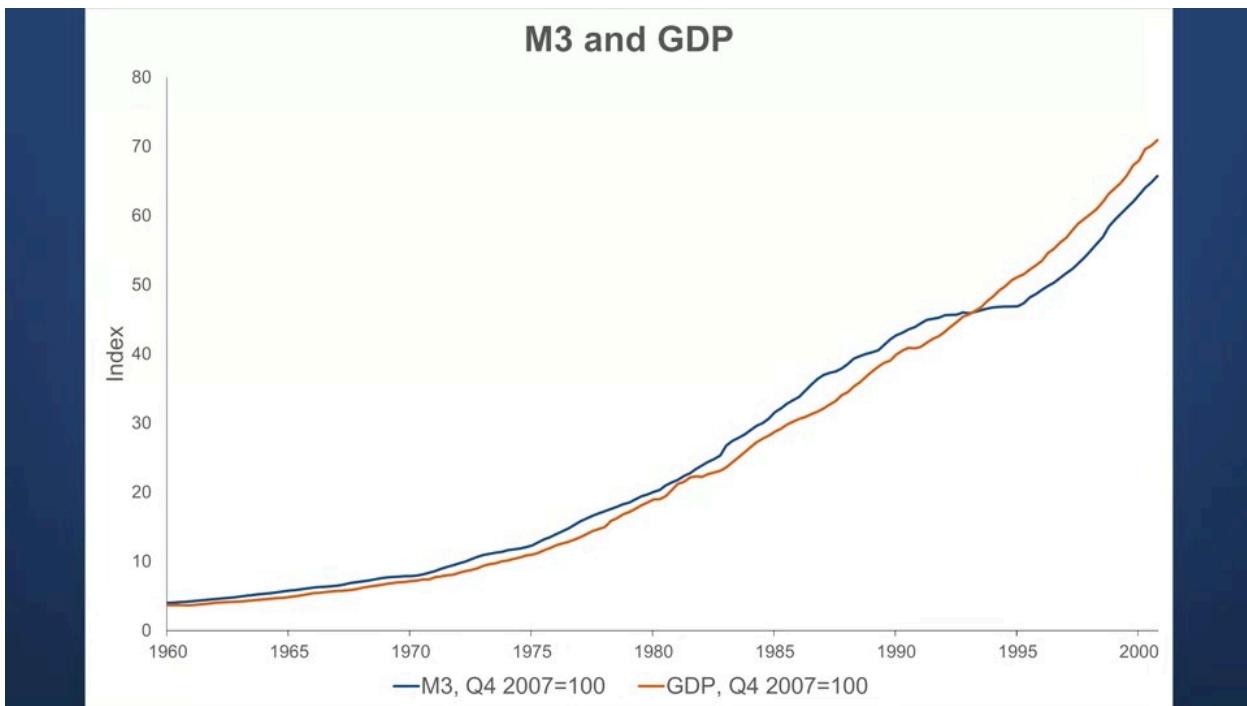
M3 = M2 + large time deposits
+institutional MMMF shares
+repos



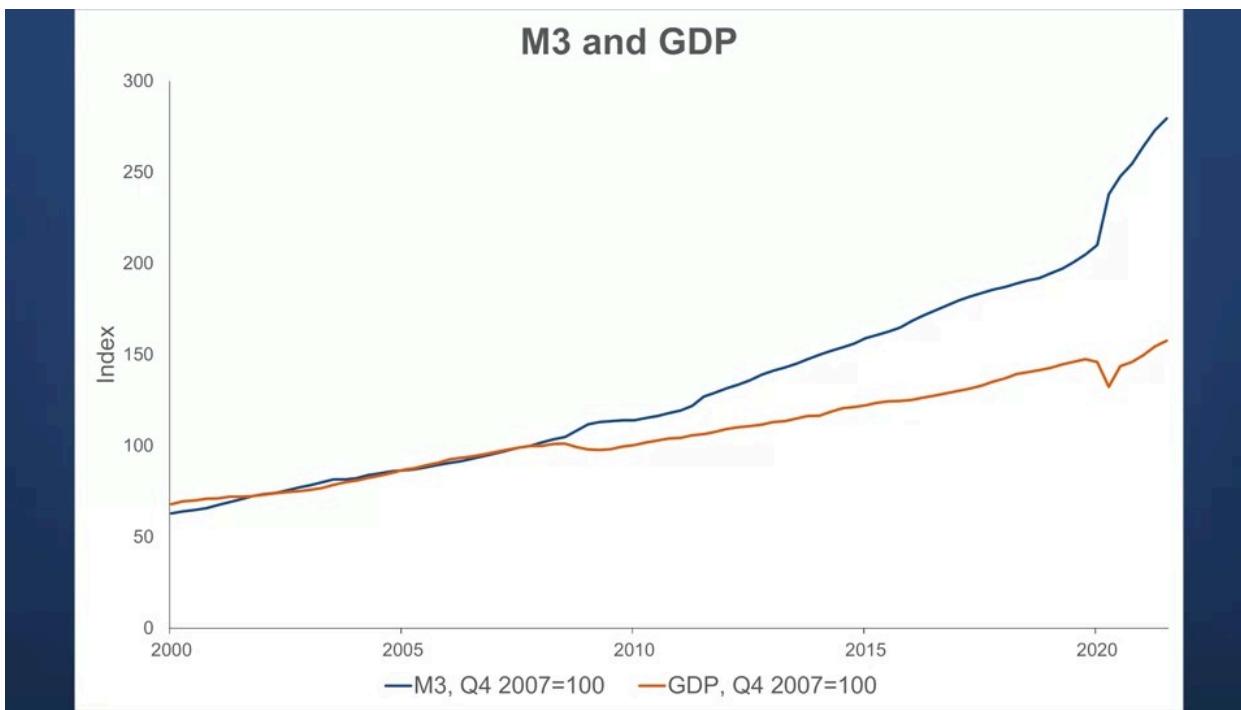
Let's look at two more measures of money supply. The most common definition is M2, which is M1 plus saving deposits, small time deposits under \$100,000 and retail money market mutual fund shares. The widest definition is M3, which adds large time deposits, institutional money market funds, short term repurchase agreements, repo and larger liquid assets to M2. Historically, measures of the money supply were closely related with other economic variables such as inflation and nominal cross domestic product GDP. And central banks have used measures of money supply when deciding on monetary policy.



You can see that M3 money supply tracks inflation reasonably well, so, there's some diversions after the recessions in the 1980s. Similarly, M3 tracks GDP well until 2000.



However, with the rise of non-bank financial institutions, it has become harder to correctly measure the money supply in particular, M3, the Federal Reserve has stopped calculating this measure. However, the relationship between M3 and inflation was not stable since the year 2000.



You can see the clear divergence here. Similarly, since the financial crisis of 2008, this relationship between M3 and GDP has been less stable. You can see the sharp divergence between the money supply and GDP starting around the financial crisis and again in the COVID-19 pandemic. Central banks now regard money supply measures as less important when making monetary policy decisions. How does the Federal Reserve affect the money supply? First, the Federal Reserve can change the reserve requirement. We call the money multiplier. The higher the reserve requirement is the more reserves banks have to hold and the less loans banks can make. In other words, the Federal Reserve can increase or decrease the money multiplier. The Federal Reserve can also conduct open market operations. That is the Federal Reserve's buys or sells Treasury securities. If the Federal Reserve buys treasuries from banks, it pays the banks with reserves. The banks can use these reserves to make additional loans, increasing the money supply. This channel mechanism of increasing and decreasing the money supply is one way through which monetary policy tools work. You can also see this when you consider how total money supply is related to interest rates. Interest rates are the price of money over a period of time. So, if money is vitally available, interest rates will fall. However, if money is scarce, interest rates will rise.

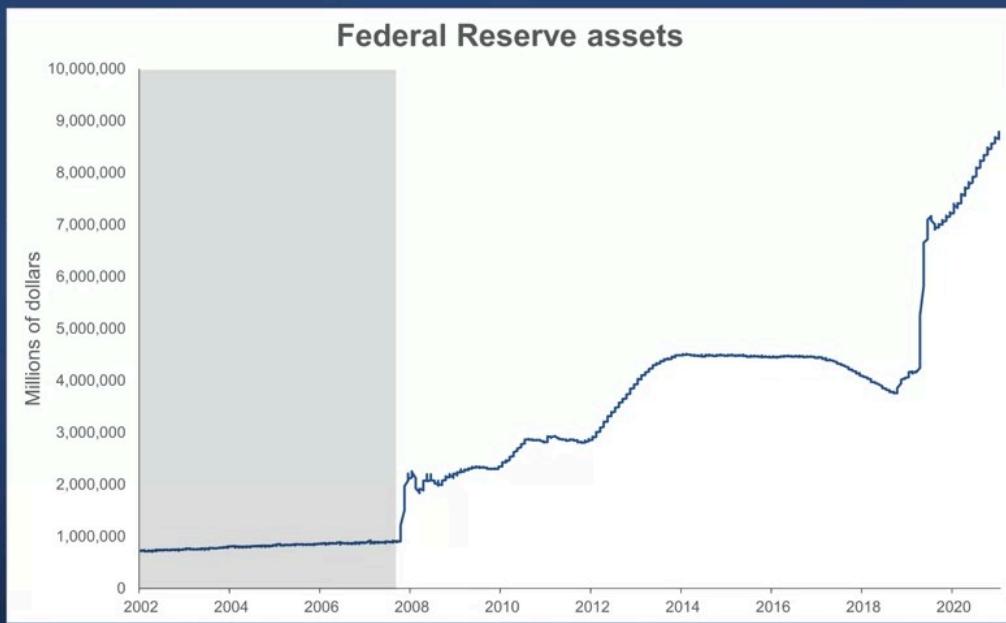


Summary

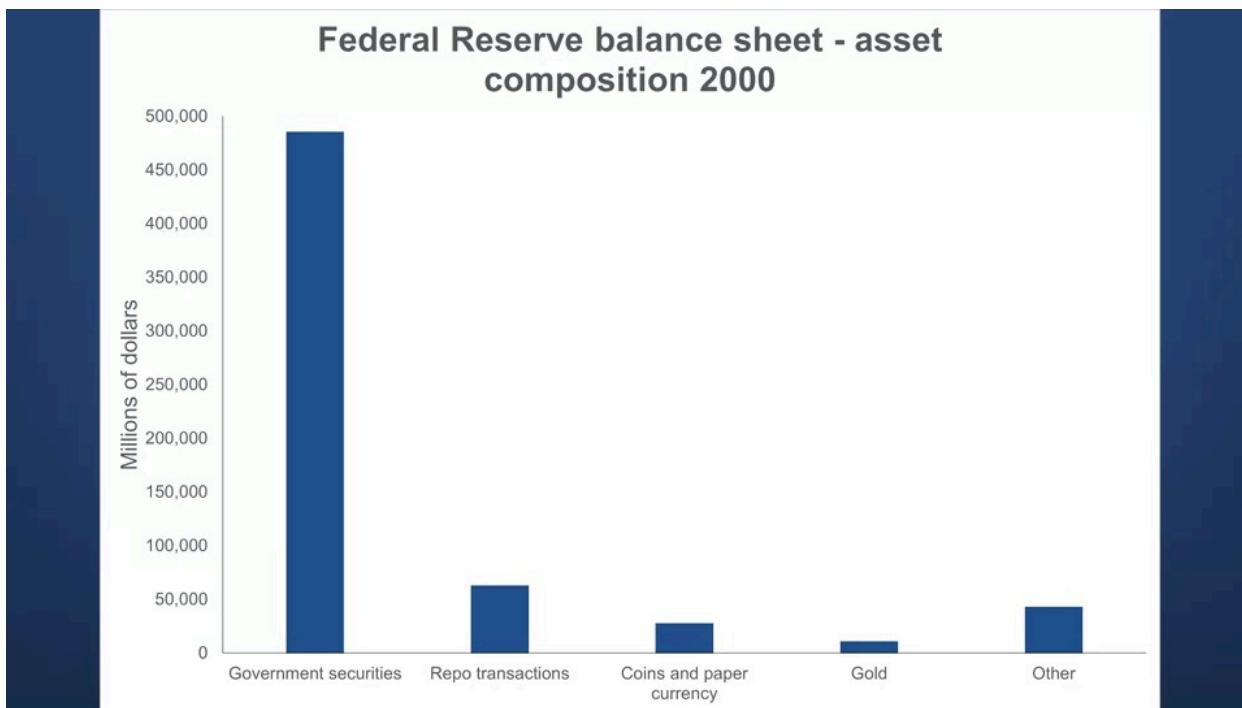
- $M^*V = P^*T$
- Measurement of money supply:
Monetary base, M1, M2, and M3
- Higher reserve requirements reduce money multiplier

In this lecture, we have discussed the concept of money supply. First, the quantitative theory of money states that the value of all goods and services has to be equal to the total supply of money. Second, there are several measures of money supply, monetary base, M1, M2 and M3. Third, the money multiplier affects the money supply. Fourth, monetary policy can increase or decrease the money supply.

Lesson 2-2.2: Federal Reserve's Balance Sheet

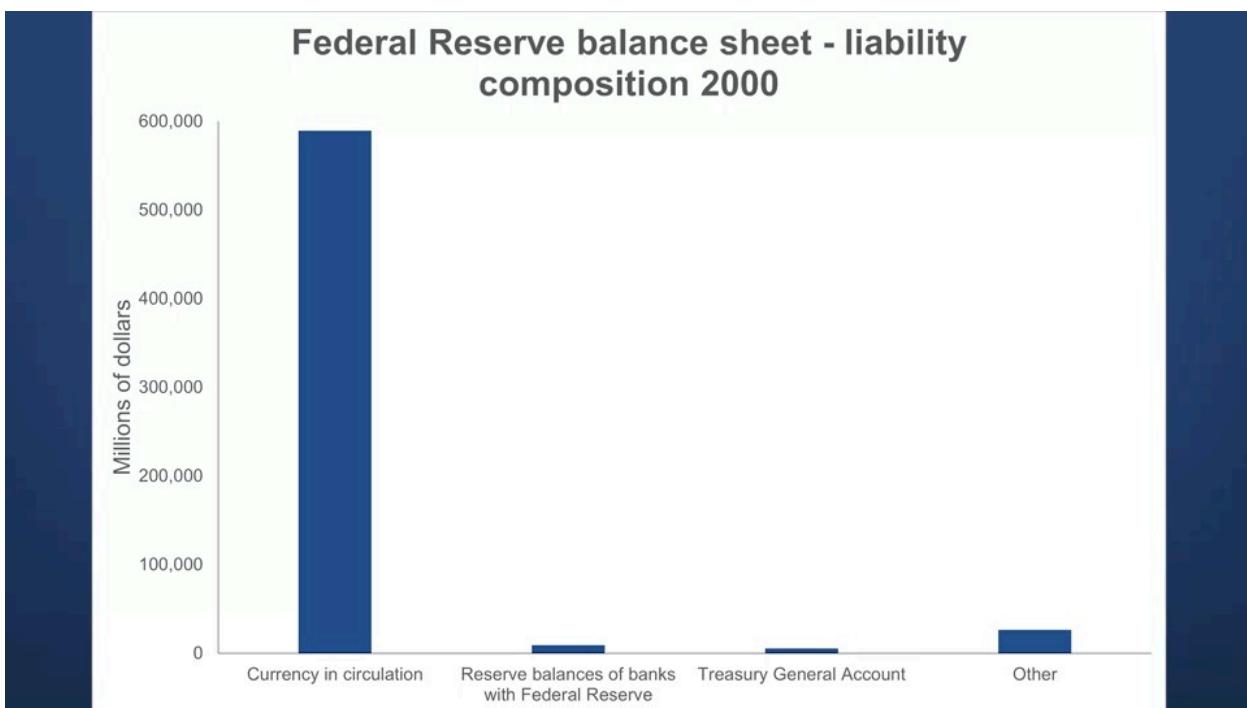


Hello and welcome to this lecture on the Federal Reserve's balance sheet. In this class, we will examine the components of the Federal Reserve's balance sheet and how its composition has changed over time. Every week, the Federal Reserve publishes a detailed balance sheet. By listing detailed reports about the composition of assets and liabilities, the Federal Reserve provides a lot of information about its operations. This allows market participants to track and understand the implementation of monetary policy. With the 2008 financial crisis and the creation of new lending facilities, the size and complexity of the Federal Reserve's balance sheet has increased considerably. Let's start by looking at the size of the Federal Reserve balance sheet over time. As you can see in the early 2000s, the Federal Reserve held assets worth about \$800 billion. With the 2008 financial crisis, the balance sheet more than doubled. By 2009, the Federal Reserve held assets worth a little over two trillion dollars. With the quantitative easing or QE programs from 2009-2014, the balance sheet more than doubled to over four trillion dollars and during the COVID-19 pandemic, the balance sheet size doubled again and reached eight trillion dollars in summer of 2021. Now, let's look at the asset composition in more detail using a pre-financial crisis balance sheet.

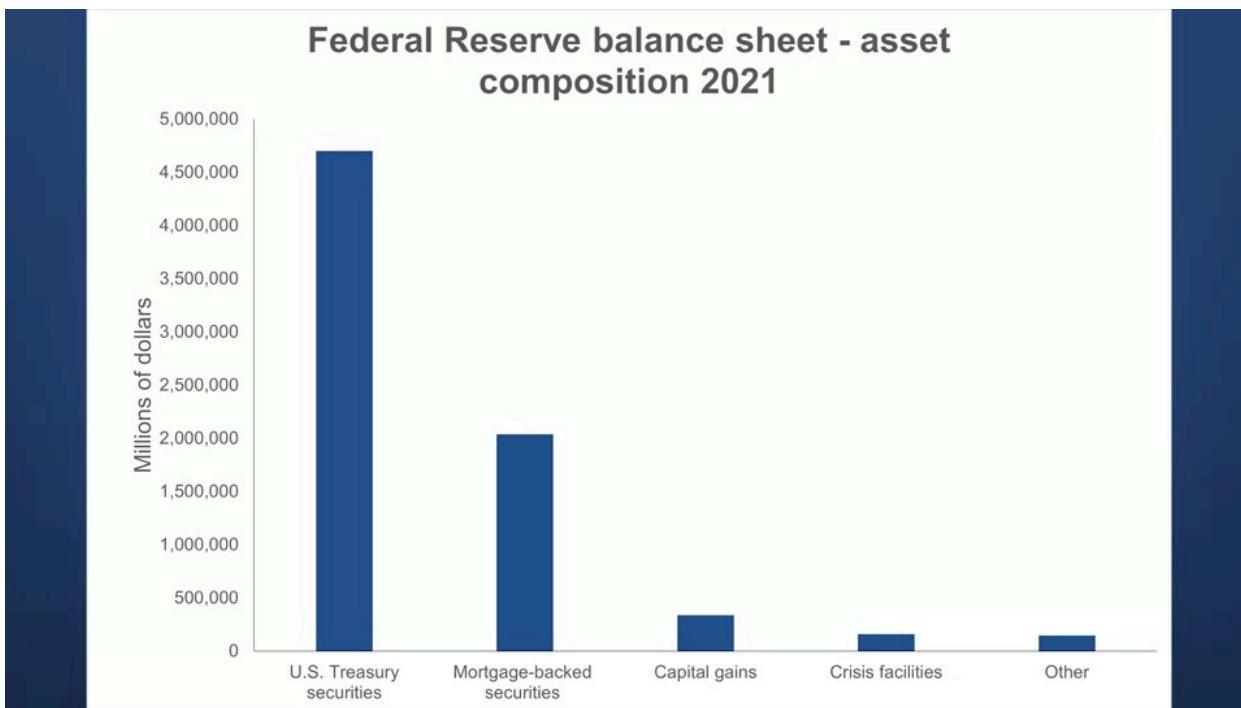


The assets of the balance sheet back the money and reserves. That is the monetary base issued by the Federal Reserve. On Wednesday, January 12th, 2000, the Federal Reserve held assets worth about \$630 billion. The largest asset position accounting for about three quarters of all assets are government securities worth 485 billion.

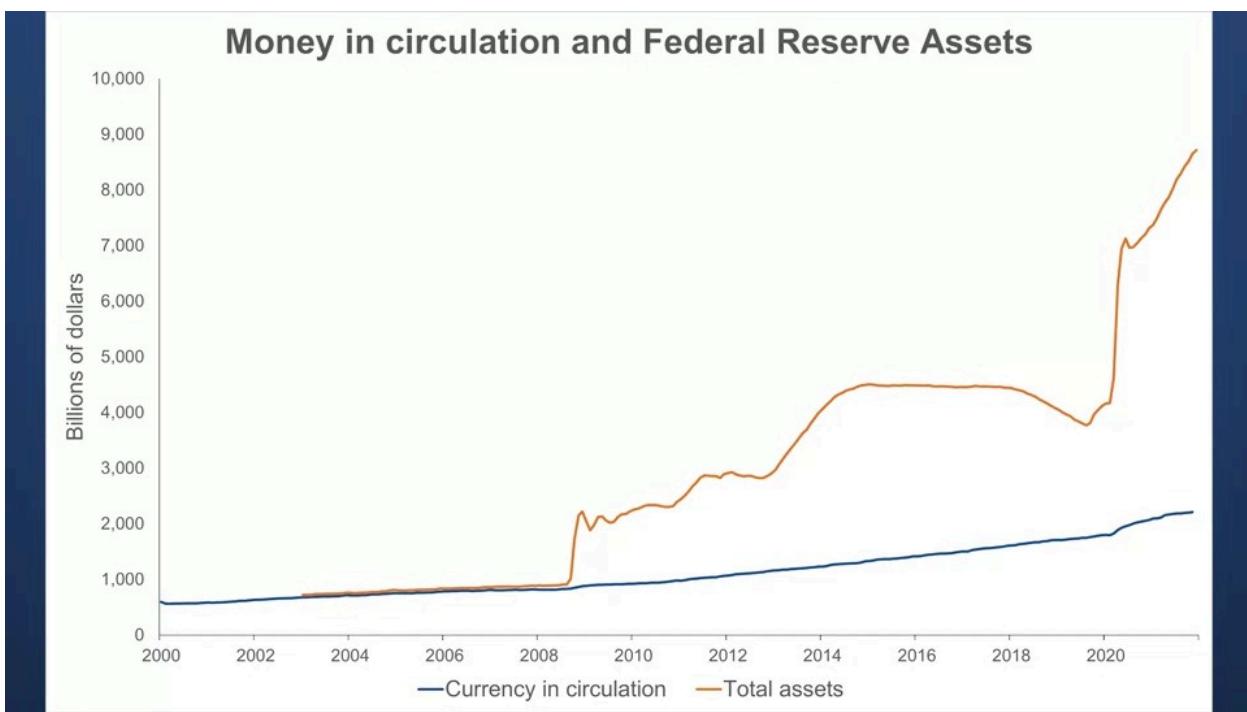
Government securities are shown at book value, meaning par and not at market value. The second largest position are repo transactions for which the Federal Reserve lends out cash as part of temporary open market operations. The Federal Reserve also holds treasury currency, which is coin and paper currency, excluding Federal Reserve notes. The gold stock reflects the gold that the US Treasury has monetized. Monetization works as follows. The US Treasury issues certificates reflecting the value of the gold to the Federal Reserve in return for credit. Other assets on the Federal Reserve's balance sheets are mostly related to premia at which the government bought securities. That is, if securities were bought at a price other than par value, then this is where the capital gains show up.



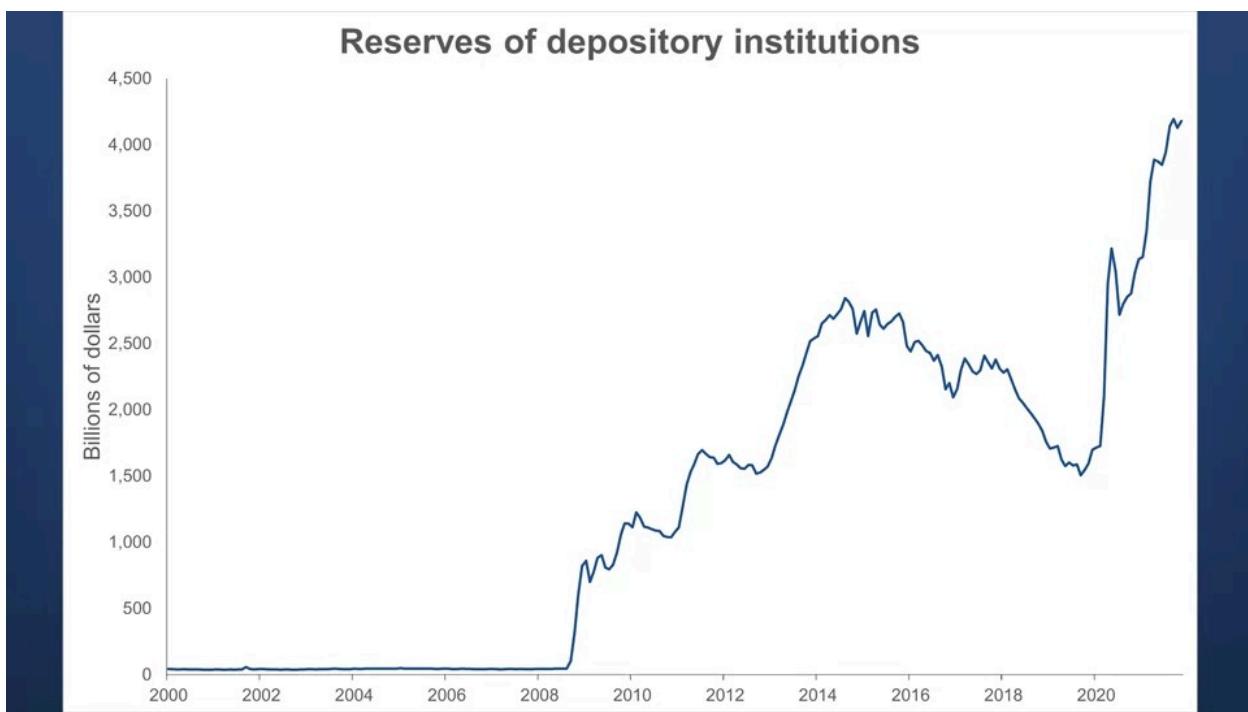
Now, let's look at the liability side of the balance sheet. Here, the largest position is currency in circulation. That is the dollar notes and coins in your pockets worth about 590 billion. Then there are reserved balances of banks with the Federal Reserve. These include bank balances at the Federal Reserve that are used to satisfy reserve requirements. That is, the cash banks have to hold at the Federal Reserve by law and balances held in excess of reserve requirements. Other deposits with the Federal Reserve include balances for payment provision and the United States Treasury general account from which all US government payments are made. Tax receipts and proceeds from US Treasury debt sales are deposited into this account. The balance sheet on January 12th, 2000 was small compared with 20 years later. Indeed, in the early 2000s, it was not even a 10th of the size of the balance sheet during the COVID-19 pandemic. How did this expansion of the balance sheet happen?



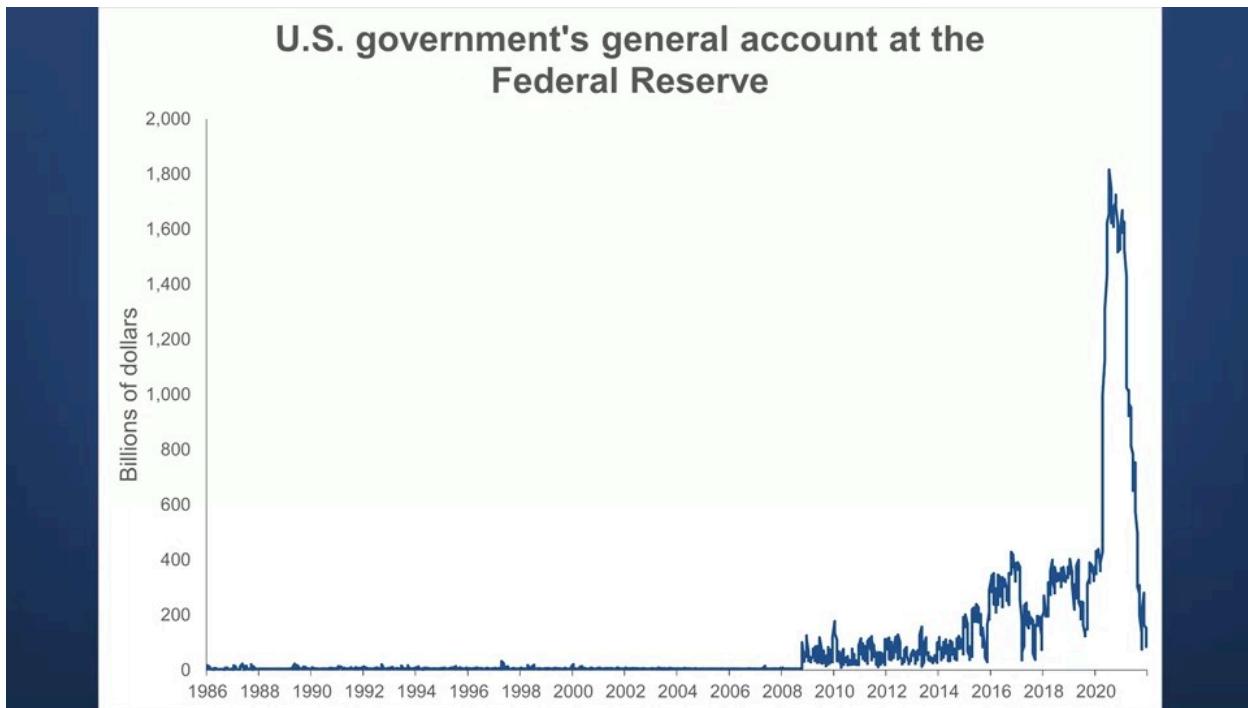
Let's start by examining the composition of assets the Federal Reserve held on the balance sheet in early 2021. On January 7th, 2021, the balance sheet of the Federal Reserve was \$7.3 trillion. The Federal Reserve held US Treasury securities worth over 4.6 trillion. In addition, the Federal Reserve held mortgage-backed securities, that is, bonds backed by mortgages from government-sponsored and backed enterprises worth over two trillion dollars. These bonds are guaranteed by the US Treasury. So government securities accounted for over 90% of the balance sheet. Capital gains amounted to about \$300 billion and crisis facilities accounted for another 160 billion. The remainder are other assets. The main driver for balance sheet growth on the asset side, are government securities held by the Federal Reserve. How did the Federal Reserve finance this massive expansion of the balance sheet? Did the Federal Reserve just print more paper money to grow its balance sheet?



Let's look at total currency in circulation over time. As you can see, money in circulation has increased a lot. Over the span of 20 years, it almost quadrupled. However, if you look at currency in circulation relative to the size of the total federal reserve balance sheet, the importance of currency in circulation has declined sharply. If the Federal Reserve did not print paper money to grow its balance sheet, what did the Federal Reserve do instead? The Federal Reserve does not buy government securities from the US Treasury directly, but purchases them on the secondary market. Such purchases are paid with cash, but since the government securities are purchased from banks, the Federal Reserve credits the bank's reserves accounts.



As you can see, with the 2008 financial crisis, the quantitative easing program and the COVID-19 pandemic bank reserves at the Federal Reserve skyrocketed and accounted for about 40% of liabilities in early 2021. Most of the remaining liabilities are to the US government's general account.



With increased debt issuances and crisis programs, the federal government deposited more money at the Federal Reserve. At its peak, the US general accounts share of Federal Reserve liabilities was over 2%.



Summary

- Balance sheet of the Federal Reserve
 1. Assets = government securities
 2. Liabilities = currency + bank reserves
- Dramatic expansions due to crisis interventions

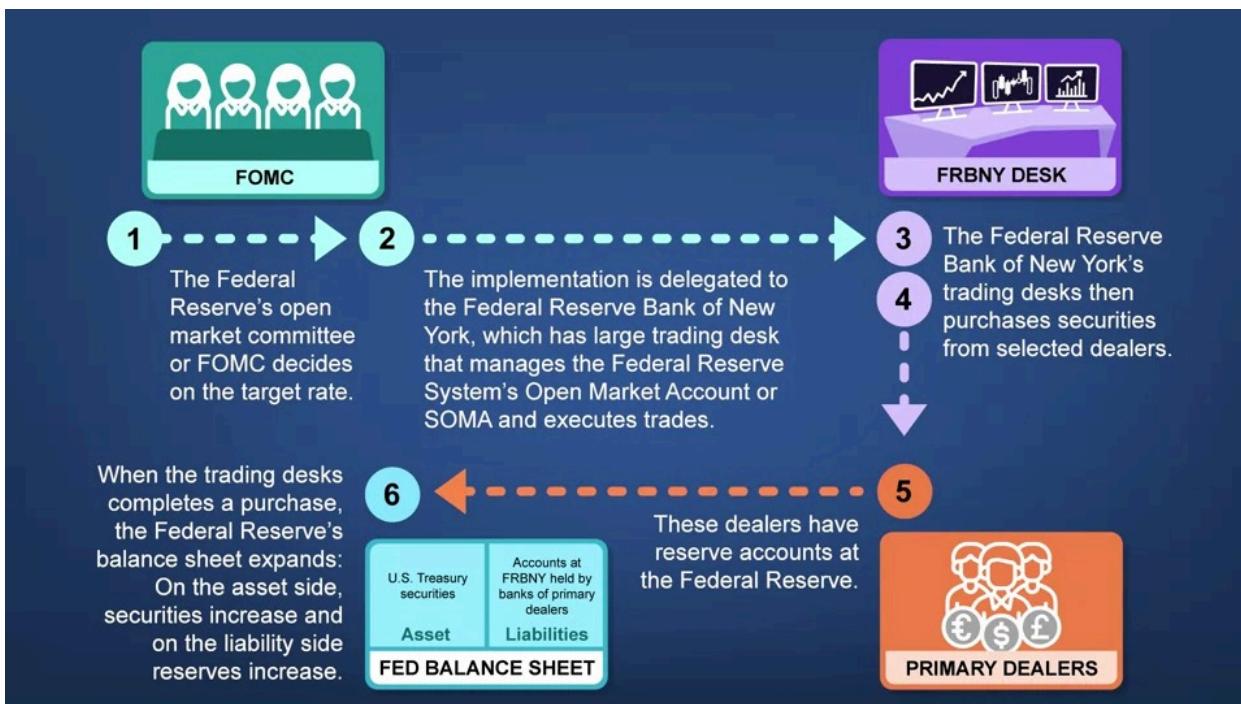
In this lecture, we have discussed the Federal Reserve balance sheet and its components. The key takeaways are, first, the main asset held by the Federal Reserve is government securities. These assets back the monetary base. Second, the main liability is the monetary base consisting of currency in circulation and bank reserves. Third, the size of the balance sheet went up by a factor of 10 due to the 2008 financial crisis and the COVID-19 pandemic.

Lesson 2-2.3: Open Market Operations

Before the 2008 Financial Crisis

- Open market operations

Hello and welcome to this lecture on Federal Reserve Open Market Operations. In this class, we will examine the historically most important way to implement monetary policy. We will discuss how the Federal Reserve uses the sale and purchase of securities to keep interest rates on target. Before the 2008 financial crisis, the Federal Reserve relied on Open Market Operations to achieve its federal funds' rate target. By conducting Open Market Operations, the Federal Reserve changes the supply of reserves. Bank reserves at the Federal Reserve are called Federal Funds. The level of reserves, which is the supply of funds in the Federal Funds Market, determines the interest rate in this market. The federal funds rate, the Federal Reserve calibrated Open Market Operations on a daily basis, based on estimates of supply and demand for reserves.



Let's have a look at how this works. The Federal Reserve's Open Market Committee, or FOMC, decides on a target rate. The implementation is delegated to the Federal Reserve Bank of New York, which has a large trading desk that manages the Federal Reserve Systems Open Market Account or SOMA and executes trades. The Federal Reserve Bank of New York's trading desk, then purchase the securities from selected dealers. These dealers have reserve accounts at the Federal Reserve. When the trading desk completes a purchase, the Federal Reserve balance sheets expand. On the asset side, securities increase and on the liability side, reserves increase. The Federal Reserve does not buy any security. Open Market Operations are conducted mostly in the market for US Treasury securities. The main reason is that US Treasury securities are highly liquid. This means that the Federal Reserve can conduct Open Market Operations without distorting prices, and there's always somebody who's willing to trade.

Outright Treasury Securities Operations

7/19/2021

RESULTS	AMOUNT (\$Millions)	
Operation Type	Par Submitted	Par Accepted
Outright Coupon Purchase	3,099	1,401
Operation Date:	Monday, July 19, 2021	
Release Time:	10:10 AM	
Close Time:	10:30 AM	
Settlement Date:	July 20, 2021	
Maturity/Call Date Range:	February 15, 2036 - November 15, 2043	

[Recent Operations](#) | [Historical Search](#)

Here's an example of a daily transaction of the Federal Reserve. On July 19th, 2021, the trading desk bought US Treasury securities with a book or par value of \$1.4 billion, but there's more information here. The maturity of the US Treasury securities. As you can see, the Federal Reserve purchased securities with a remaining maturity of 15 to 22 years. The outright purchase is the most common transaction.

Domestic Holdings: Includes CUSIP-level data and SOMA Historical Data Export Builder. Data are updated Thursdays with previous day's holdings.	
	7/15/2021
SECURITY TYPE	VOLUME (\$Thousands)
US Treasury Bills (T-Bills)	326,044,000.0
US Treasury Notes and Bonds	4,460,904,892.7
US Treasury Floating Rate Notes (FRN)	23,846,691.1
US Treasury Inflation-Protected Securities (TIPS)*	354,886,562.0
Federal Agency Debt Securities**	2,347,000.0
Agency Mortgage-Backed Securities***	2,392,591,797.9
Agency Commercial Mortgage-Backed Securities***	9,769,885.7
Total SOMA Holdings	7,570,390,829.3
Change From Prior Week	102,527,270.7

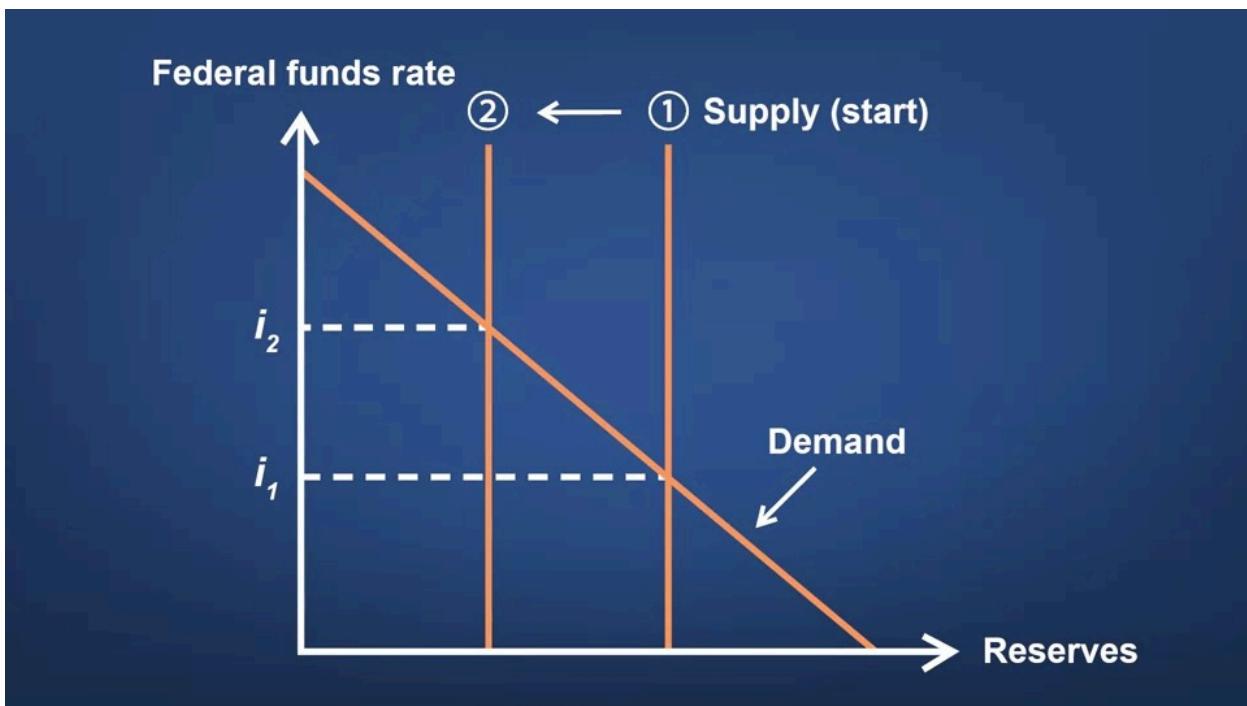
Here's a snapshot of the systems open market account portfolio from July 19th, 2021. All of the securities are US government debt or debt guaranteed by the US government.

The portfolio increased by about a 100 billion relative to the prior week. What is missing here is that the Federal Reserve also conducts Open Market Operations through repurchase agreements. You can look up daily transactions, including repurchase transactions on the Federal Reserve Bank of New York website. I just mentioned that the Federal Reserve only trades with selected dealers. Here the idea is that these dealers are large enough to always conduct trades with the Federal Reserve to ensure that monetary policy can always be implemented. The selected dealers, the so-called prime dealers, undergo periodic reviews and have to show that they're in good financial conditions.

Before the 2008 Financial Crisis

- Low levels of aggregate level of reserves

The pre-financial crisis approach of daily managing available reserves meant that there was a relatively low aggregate level of reserves in the banking system. Each day, banks traded reserves to meet their reserve requirements and not missing out on opportunities by holding excess reserves. However, this system also had a downside. Small variations in aggregate supply of reserves could affect the level of rates in the federal funds market.



Let us look at how Open Market Operations work in this environment. Every day, the Federal Reserve Bank of New York estimates how many reserves will be needed to make sure that the interest rates on federal funds is in the federal funds' target range. You can see in this chart, where supply and demand for federal funds meet, the market equilibrium determines the federal funds rate. The Federal Reserve Bank of New York would buy and sell securities on a daily basis to keep the federal funds rate at the desired level. Now assume the Federal Reserve wants to increase the federal funds rate. To achieve this goal, the Federal Reserve will sell securities which will be paid for these reserves. This reduction in reserves shifts the supply of federal funds in the federal funds market to the left. The new equilibrium features fewer federal funds which will be sold at a higher interest rate. Conversely, if the Federal Reserve wants to lower the federal funds rate, then the Federal Reserve Bank of New York will buy securities from banks. These purchases are paid for with reserves. Hence, the overall available funds in the federal funds market increases. That is the supply curve shifts to the right. In the new equilibrium with more federal funds, the federal funds rate will be lower. The 2008 financial crisis marks a break-point in the way Open Market Operations were conducted. The FOMC is target for the federal funds rate from 5 and a 1/4 percent, in mid-2007 to a range of 0 to a 1/4 percent in December 2008. But it is hard to force interest rates below 0 when further action was needed.

2008 Financial Crisis

- Buying more securities was no longer effective

Simply buying more securities to increase reserves was no longer effective to lower interest rates. So the FOMC shifted the focus of its monetary policy implementation directives to the systems open market account portfolio. Open market operations were then conducted to facilitate changes in the size and composition of the portfolio. After the financial crisis, banks held considerably more reserves than before the financial crisis. This meant, that open market operations that had affected the aggregate supply of reserves in the past would not be as effective in controlling the short-term interest rate. We will discuss how this was done in a separate lecture. In October 2017, the FOMC started to normalize the systems open market account portfolio by gradually reducing its reinvestment of principal payments received from the SOMA securities. Note that the Federal Reserve ruled off the securities, by not reinvesting repaid principle, rather than selling securities which could have affected the interest rate.



Summary

- OMOs affect Fed's target interest rate via interbank market
- Before 2008 crisis, OMOs were main monetary policy tool
- After 2008, new tools needed

In this lecture, we have discussed the Federal Reserve's open market operations. The key takeaways are, first, open market operations affect the supply of reserves, which in turn determine the federal funds rate, the Federal Reserve's target interest rate. Second, before the financial crisis, aggregate reserves were low, and open market operations were the main monetary policy tool. Third, after the financial crisis, reserves have been high and Open Market Operations were mostly conducted to support other forms of monetary policy implementation.

Lesson 2-2.4: The Discount Window

Federal Reserve Discount Window

- Discounting and discount lending

Hello, and welcome to this lecture on the Federal Reserve's discount window. In this class, we will examine the oldest monetary policy tool. We will discuss how the Federal Reserve uses the discount window to provide liquidity to banks. Discount and discount lending has a long tradition in banking. The key idea is that the lender calculates the interest and discounts them from the face amount before lending to the borrower. The borrower then has to pay back the face amount, the principal, and the interest.



Let's go through a quick example. You want to take out a discount loan with a face value of \$100. The maturity of the loan is one year and the discount rate is 10%. So the total interest is going to be 10%.



The loan amount that you receive is now the face value of \$100 minus the interest, \$10, that is \$90.

1 year later



But in a year you will have to repay \$100. With the interest accounted for upfront, typically only one payment is required rather than monthly interest payments. For that reason, discount loans were often issued when the borrower needs short term funding. How did the Federal Reserve use discounts? When the Federal Reserve was established in 1913, the Federal Reserve discounted short term commercial loans owned by banks. This transaction was however not alone. The Federal Reserve bought commercial loans for less than their face value. This means the Federal Reserve could avoid taking losses by using a discount rate that would incorporate the risk of default of the commercial loans that it bought. Historically, the Federal Reserve was authorized to lend only to banks that had chosen to become members of the Federal Reserve system. Discounting was made at a special window at each of the reserve banks called the discount window, and hence the name discount window lending. However, today, all depository institutions that offer transaction accounts subject to reserve requirements, can borrow from the Federal Reserve. And loans by the Federal Reserve are now made in form of advances, that is loans backed by collateral pledged by the borrower rather than as discounts. However, the term discount window stuck and is still used for facilities through which the Federal Reserve lends to banks.

Three Types of Loans

- Primary credit
- Secondary credit
- Seasonal credit

At the Federal Reserve, banks have access to three types of discount window lending. Primary credit, secondary credit, and seasonal credit. Let's look at each one in turn.

PPrimary Credit

- Provider of liquidity on short notice when no other short-term credit is available
- Only available to well-capitalized banks
- Interest rate set to the upper range of the federal funds rate range

Primary credit is a lending program that serves as a provider of liquidity on short notice, ensuring adequate liquidity in the banking system. This program is available to banks which supervisors have judged to be sound and have sufficient capital.

The screenshot shows the Federal Reserve's website with a dark blue header. The top navigation bar includes links for General Information, Guidelines, Agreements, Discount Rates, Collateral, Payment System Risk, and Select Your District. A search bar is located in the top right corner. Below the header, a large section titled "Current Interest Rates" displays four categories: Primary Credit (0.25%), Secondary Credit (0.75%), Seasonal Credit (0.15%), and Fed Funds Target (0.00-0.25%). To the right of this section is a large, faint watermark of the Federal Reserve seal. Below the rates, there are six smaller images arranged in a grid, each with a caption: "Getting Started" (hands writing), "Borrowing" (two people shaking hands), "Select Your District" (eagle logo), "Collateral Eligibility" (financial data and a ruler), "Collateral Valuation" (charts and graphs), and "Pledging Collateral" (a keyboard and pen).

There are no restrictions on the use of funds borrowed. The interest rate on primary credit loans is priced relative to the Federal Open Market Committee's target range for the federal funds rate. While the loans are pre-payable and renewable by the borrower on a daily basis, the maximum duration is 90 days. The main purpose of primary credit is to provide liquidity in case other funding is not available as the discount rate is usually higher than the interest rates on other forms of short term credit. For discount rate loans, the Federal Reserve accepts a broad range of collateral.



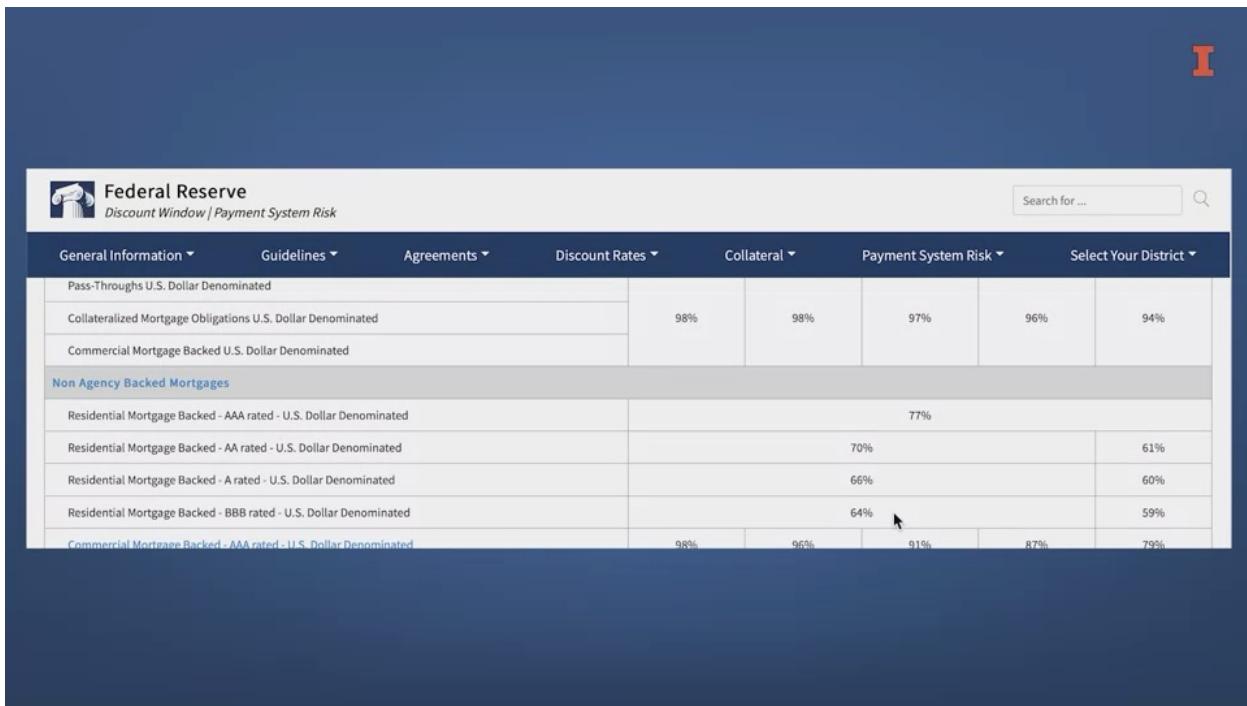
For instance, commercial and industrial loans, consumer loans, residential and commercial real estate loans, corporate bonds, asset backed securities, collateralized mortgage obligations, and US Treasury obligations. However, some of these types of collateral are riskier than others. To account for that, the Federal Reserve applies margins indicating how much the bank can borrow against each type of collateral. The Federal Reserve publishes the full marching table.

The screenshot shows the Federal Reserve's website for the Discount Window and Payment System Risk. The main menu includes General Information, Guidelines, Agreements, Discount Rates, Collateral, Payment System Risk, and Select Your District. A search bar is also present.

The central feature is a table titled "Effective Date: March 14, 2022". The table has "Securities" listed in the first column. The second column contains the heading "Margins for Securities¹ (% of market value)". The third column is labeled "Duration Buckets" and includes five categories: 0-1, >1-3, >3-5, >5-10, and >10. Below the table, there are two sections: "U.S. Treasuries & Fully Guaranteed Agencies" and "STRIPS". The "U.S. Treasuries & Fully Guaranteed Agencies" section lists "Bills, Notes, Bonds, Floating Rate Notes, and Inflation-Indexed" and shows margins of 99%, 99%, 98%, 97%, and 95% respectively. The "STRIPS" section shows a single margin of 96% across all duration buckets.

Securities	Margins for Securities ¹ (% of market value)	0-1	>1-3	>3-5	>5-10	>10
U.S. Treasuries & Fully Guaranteed Agencies		99%	99%	98%	97%	95%
Bills, Notes, Bonds, Floating Rate Notes, and Inflation-Indexed		99%	99%	98%	97%	95%
STRIPS		96%	96%	96%	96%	92%

For example, a US Treasury obligation with the remaining maturity of one year is very safe and the bank can borrow 99 cents on the dollar.



The screenshot shows a table of discount rates for different asset categories:

Asset Type	Discount Rate (%)
Pass-Throughs U.S. Dollar Denominated	98%
Collateralized Mortgage Obligations U.S. Dollar Denominated	98%
Commercial Mortgage Backed U.S. Dollar Denominated	97%
Non Agency Backed Mortgages	
Residential Mortgage Backed - AAA rated - U.S. Dollar Denominated	77%
Residential Mortgage Backed - AA rated - U.S. Dollar Denominated	70%
Residential Mortgage Backed - A rated - U.S. Dollar Denominated	66%
Residential Mortgage Backed - BBB rated - U.S. Dollar Denominated	64%
Commercial Mortgage Backed - AAA rated - U.S. Dollar Denominated	98%
	96%
	91%
	87%
	79%

In contrast, a loan for commercial real estate with the remaining maturity of one year, is still rather risky. And banks can only borrow between 35% and 95% of the power value of the loan.

Secondary Credit

- Available to banks who do not qualify for primary credit
- Overnight credit at higher interest rate
- Used for resolution of banks

Secondary credit is available to banks that are eligible to borrow from the discount

window, but they do not meet the criteria for the primary credit facility. For instance, because they're undercapitalized. These loans are extended on a very short term basis. Typically overnight. And since the financial conditions of secondary credit borrowers is generally less sound, the interest rate on secondary credit has typically been 50 basis points above the primary credit rate. The main purpose of the secondary credit is to help a bank meet its backup liquidity needs. For instance, during the resolution of a bank's financial difficulties.

Seasonal Credit Rate

- Based on market interest rate

Seasonal credit is designed to help small banks manage significant seasonal swings in their loans and deposits. Think, for instance, about banks located in agricultural areas, where lending and deposits depend on the growing and harvesting seasons. Similarly, banks located in areas with seasonal tourism experience significant seasonal swings. These banks can borrow longer term funds from the discount window during periods of seasonal need. This allows banks to hold fewer liquid assets and make more loans during the rest of the year. The seasonal credit rate is based on market rates. How is the discount window related to monetary policy? Recall that the interest rate on the primary credit that can be accessed by most banks is priced at the upper end of the federal funds target range. That means that if the federal funds rate exceeds the target range, it would be cheaper to borrow from the discount window, putting downward pressure on the federal funds rate.

Federal Funds Rate

- Discount rate enforces upper limit

Hence, the discount rate enforces the upper limit of the federal funds rate. The Federal Reserve also publishes which banks borrowed from the discount window, and at what terms. Since the discount window is generally seen as for emergency liquidity use only as federal funds are usually cheaper, banks are reluctant to borrow from it. Banks are afraid that borrowing from the discount window signals poor liquidity conditions of the borrowing bank. This is called the stigma effect. As a result, the total amount of discount window loans is small.

I

Summary

- Discount window loans meet short-term cash needs
- Discount rate > federal funds rate
- Stigma effect...why won't another bank lend to you?

In this lecture, we have discussed the Federal Reserve's discount window. The key takeaways are, first, discount window loans are short term collateralized loans through banks to smooth liquidity demand. Second, the discount window borrowing is a substitute to buying federal funds. The discount rate provides an upper limit for the federal funds rate. Third, banks are reluctant to borrow from the discount window because of the stigma effect.

Lesson 2-3: Non-traditional Monetary Policy

Lesson 2-3.1: Forward Guidance

Forward Guidance

- Unconventional monetary policy tool
- Signals policy intentions

Hello, and welcome to this lecture on forward guidance. In this class, we will examine one new monetary policy tool, forward guidance. We will discuss how the Federal Reserve communicates future monetary policy intentions and how this can affect interest rates. Forward guidance is an unconventional monetary policy tool, unconventional because it goes beyond the traditional ways of open market operations and lending to conduct monetary policy. New tools became necessary around March 2009, when the federal funds rate was set to zero. With interest rates on what is considered to be the lower bound, the Federal Open Market Committee or FOMC decided to communicate how it intends to adjust monetary policy in the future. This form of communication is called forward guidance, and has been used to signal the FOMC's policy intentions to the public. Let's look at what types of communication the Federal Reserve uses. Since 1994, the FOMC has issued statements announcing the FOMC decisions.

Federal Reserve Release



Press Release

Release Date: March 16, 2004

For immediate release

The Federal Open Market Committee decided today to keep its target for the federal funds rate at 1 percent.

The Committee continues to believe that an accommodative stance of monetary policy, coupled with robust underlying growth in productivity, is providing important ongoing support to economic activity. The evidence accumulated over the intermeeting period indicates that output is continuing to expand at a solid pace. Although job losses have slowed, new hiring has lagged. Increases in core consumer prices are muted and expected to remain low.

The Committee perceives the upside and downside risks to the attainment of sustainable growth for the next few quarters are roughly equal. The probability of an unwelcome fall in inflation has diminished in recent months and now appears almost equal to that of a rise in inflation. With inflation quite low and resource use slack, the Committee believes that it can be patient in removing its policy accommodation.

Voting for the FOMC monetary policy action were: Alan Greenspan, Chairman; Timothy F. Geithner, Vice Chairman; Ben S. Bernanke; Susan S. Bies; Roger W. Ferguson, Jr.; Edward M. Gramlich; Thomas M. Hoenig; Donald L. Kohn; Cathy E. Minehan; Mark W. Olson; Sandra Pianalto; and William Poole.

[2004 Monetary policy](#)

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Last update: March 16, 2004

Before the 2008 financial crisis, these statements were brief, check out this statement for March 16, 2004. It consists of one sentence about the interest rate, one paragraph summarizing current economic conditions, and one paragraph of potential risks. But notice the absence of any indication about any future monetary policy action. Last, the statements also indicate which FOMC members voted for an action, and which members, if any descended from it. Now, let's play Fed Watcher, and compare this statement to the previous statement from January 28th, 2004.

Federal Reserve Release



Press Release

Release Date: January 28, 2004

For immediate release

The Federal Open Market Committee decided today to keep its target for the federal funds rate at 1 percent.

The Committee continues to believe that an accommodative stance of monetary policy, coupled with robust underlying growth in productivity, is providing important ongoing support to economic activity. The evidence accumulated over the intermeeting period confirms that output is expanding briskly. Although new hiring remains subdued, other indicators suggest an improvement in the labor market. Increases in core consumer prices are muted and expected to remain low.

The Committee perceives that the upside and downside risks to the attainment of sustainable growth for the next few quarters are roughly equal. The probability of an unwelcome fall in inflation has diminished in recent months and now appears almost equal to that of a rise in inflation. With inflation quite low and resource use slack, the Committee believes that it can be patient in removing its policy accommodation.

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[Accessibility](#)
Last update: March 16, 2004

In the second paragraph, the description of the economy slightly changed. In January, the expansion was brisk, but in March it was only an expansion at a solid pace, this indicates the growth rate abide still positive has decreased. Similarly, the description of the labor market is less favorable, the last paragraph is the same, except for the insertion of that. Financial markets analysts watch these changes in language closely. What have they learned from comparing these two statements is that over the span of six weeks, the Federal Reserve changed its opinion about the state of the economy quite a bit. While the January statement was quite upbeat, the March statement was less so. Hence, market participants can infer that it is unlikely that the Federal Reserve would tighten monetary policy in the next meeting even so, no statement about future monetary policy is explicitly included. With the 2008 financial crisis, FOMC statements have summarized the judgment about the appropriate conduct of monetary policy. They also provided guidance about the factors that the FOMC will consider in setting monetary policy.

In light of increasing economic slack here and abroad, the Committee expects that inflation will remain subdued. Moreover, the Committee sees some risk that inflation could persist for a time below rates that best foster economic growth and price stability in the longer term.

In these circumstances, the Federal Reserve will employ all available tools to promote economic recovery and to preserve price stability. The Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent and anticipates that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period. To provide greater support to mortgage lending and housing markets, the Committee decided today to increase the size of the Federal Reserve's balance sheet further by purchasing up to an additional \$750 billion of agency mortgage-backed securities, bringing its total purchases of these securities to up to \$1.25 trillion this year, and to increase its purchases of agency debt this year by up to \$100 billion to a total of up to \$200 billion. Moreover, to help improve conditions in private credit markets, the Committee decided to purchase up to \$300 billion of longer-term Treasury securities over the next six months. The Federal Reserve has launched the Term Asset-Backed Securities Loan Facility to facilitate the extension of credit to households and small businesses and anticipates that the range of eligible collateral for this facility is likely to be expanded to include other financial assets. The Committee will continue to carefully monitor the size and composition of the Federal Reserve's balance sheet in light of evolving financial and economic developments.

Let's have a look at the statement from March, 18th 2009. Here, the FOMC indicates that the Committee will maintain the target range for the federal funds rate at zero to a quarter percent. And anticipates that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period. The close for an extended period, signals that the federal funds rate will be kept low at an exceptionally low level, meaning zero for a long time. So financial market analysts would probably expect the federal funds rate to remain at zero for at least two years, but it is not exactly clear what extended period means.

December 12, 2012

Federal Reserve issues FOMC statement

For immediate release

Share 

Information received since the Federal Open Market Committee met in October suggests that economic activity and employment have continued to expand at a moderate pace in recent months, apart from weather-related disruptions. Although the unemployment rate has declined somewhat since the summer, it remains elevated. Household spending has continued to advance, and the housing sector has shown further signs of improvement, but growth in business fixed investment has slowed. Inflation has been running somewhat below the Committee's longer-run objective, apart from temporary variations that largely reflect fluctuations in energy prices. Longer-term inflation expectations have remained stable.

Now, consider this statement from December 12, 2012, first, you will notice that this statement is considerably longer. The FOMC explains much more about the economy and specific sectors such as households and business investment, but here, the FOMC also does something new.

To support continued progress toward maximum employment and price stability, the Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens. In particular, the Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored. The Committee views these thresholds as consistent with its earlier date-based guidance. In determining how long to maintain a highly accommodative stance of monetary policy, the Committee will also consider other information, including additional measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. When the Committee decides to begin to remove policy accommodation, it will take a balanced approach consistent with its longer-run goals of maximum employment and inflation of 2 percent.

In paragraph five, it states that the Committee decided to keep the target range for the federal funds rate at zero to quarter percent. And currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as

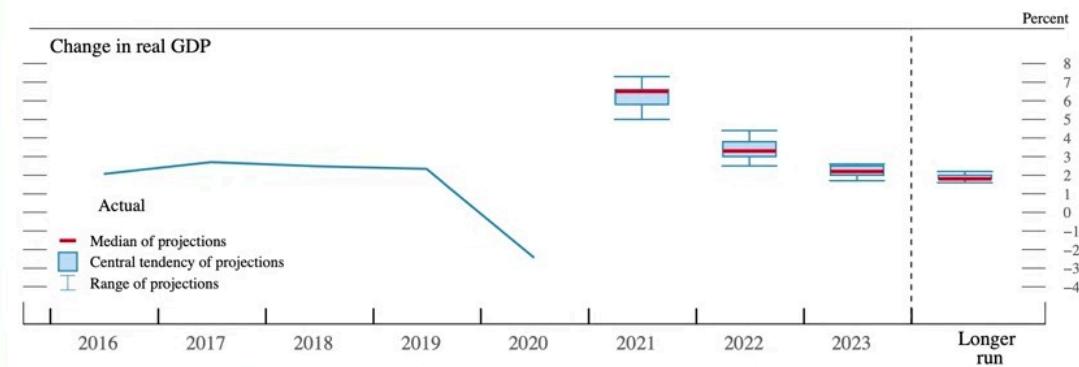
the unemployment rate remains above 6.5%. Inflation between one and two years ahead is projected to be no more than half a percentage point, above the Committee's 2% longer run goal, and longer term inflation expectations continue to be well anchored. This is quite a sentence, so let's unpack this. The FOMC says, that the federal funds rate will remain at zero as long as first, unemployment is above 6.5%. Second, expected inflation in one or two years, it's not above 2.5%. And third, inflation expectations remain well anchored, which means that everybody still expects 2% inflation in the long run. In other words, the FOMC told market participants that the interest rate will stay low for long period with precise conditions. This type of forward guidance gives planning certainty as it clarifies what extended period means. The FOMC also releases minutes from its meetings three weeks after each meeting. The minutes give insights about which policy related topics received a significant amount of attention during the meeting. They also describe in more detail the views expressed by participants, the risks and uncertainties in the outlook, and the reasons for the Committee's decisions. This way, market participants can better understand how the FOMC reached its decisions. Of course, financial market analysts come through these minutes to gain insight about future monetary policy.

Federal Open Market Committee (FOMC)

- Summary of Economic Projections

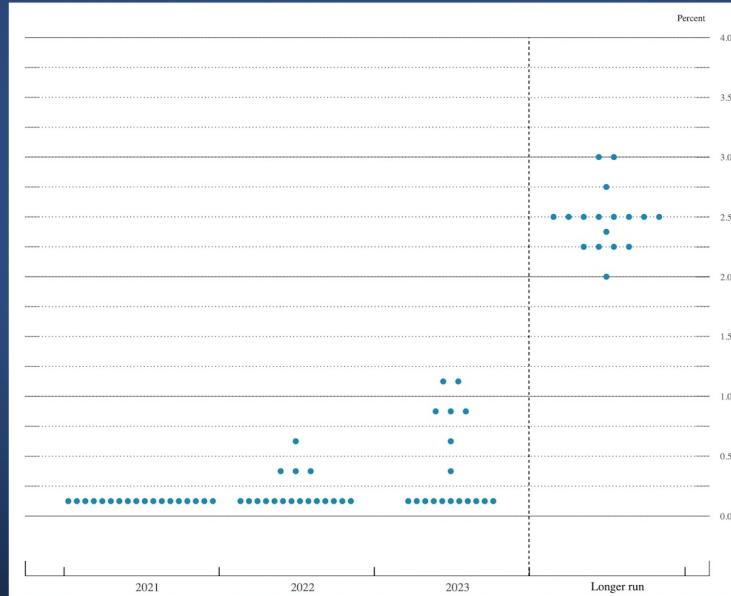
In addition to the statements, the FOMC started to publish the summary of economic projections four times each year beginning in late 2007. The projections provide FOMC participants assessments of future real gross domestic product growth, the unemployment rate, inflation, and the federal funds rate over the medium term and over the longer run. And since each participant has her or his own assessment, financial market analysts see the ranges of the FOMC participant forecasts. Let's have a look at the summary of economic projections for March 17, 2021.

Figure 1. Medians, central tendencies, and ranges of economic projections, 2021–23 and over the longer run



Here's the chart for changes in real GDP, that is GDP growth, accounting for inflation. You can see that the forecast for 2021 varies between 5% and 7.3%, these differences are driven by the uncertainty about the recovery from the COVID-19 pandemic. However, in the long run, the estimates of participants are really close to each other, so there's little disagreement about the long run. The chart financial analysts pay most attention to is the distribution of federal funds rate expectations, the so called dot plot.

FOMC interest rate expectations



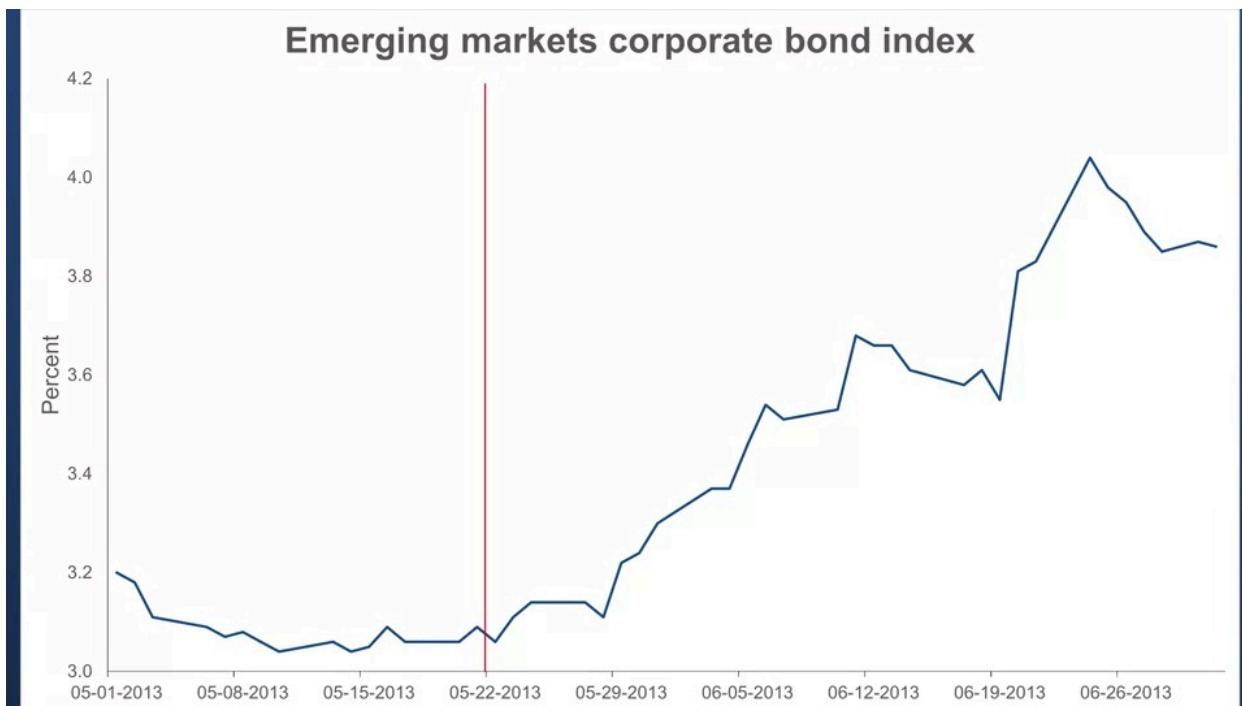
You can see that no participant expects the federal funds rate to increase from zero in

2021. However, four participants think that sometime in 2022, the economy will have recovered sufficiently to increase the federal funds rate at least once. And almost half of the participants see the federal funds rate increases by the end of 2023. In the longer run, participants expect the federal funds rate to be between 2% and 3%. Of course, these forecasts are subject to revisions, but they provide insights in the FOMC participants thinking and allow for more planning certainty for financial markets and firms. Another way to communicate policy intentions are press conferences, the Federal Reserve Chair holds four times a year and testimonies at congress. You may wonder why the communications or the Federal Reserve are sometimes hard to read. Usually, these are very carefully crafted statements that does not mean that they cannot be misunderstood.

The Fed could begin
tapering bond purchases
“...in the next
few meetings”

-Ben Bernanke, May 22, 2013

Speaking before Congress's Joint Economic Committee on March 22, 2013, Ben Bernanke, the van chair of the Federal Reserve, said that the Fed could begin tapering bond purchases in the next few meetings. Financial market analysts interpreted his remarks as a sign that the Federal Reserve's easy money era was ending. As a result, one deals flows and money flowed out of emerging markets.



As you can see in the chart, emerging market bond yields went up significantly after May 22nd, this episode is now known as the taper tantrum. The taper tantrum was short lived, especially since the Federal Reserve did not stop purchases or sold bonds. However, this episode illustrates the power of forward guidance, it can move market participants' expectations and therefore markets in significant ways.

Summary

- Unconventional monetary policy tool
- Forward guidance influences market expectations
- Financial analysts pay close attention
- Specificity avoids misunderstanding

What have we learned in this lesson? First, forward guidance is an unconventional monetary policy tool. Second, since the 2008 financial crisis, the Federal Reserve has

used forward guidance to influence financial markets. Third, forward guidance is most effective when it is specific.

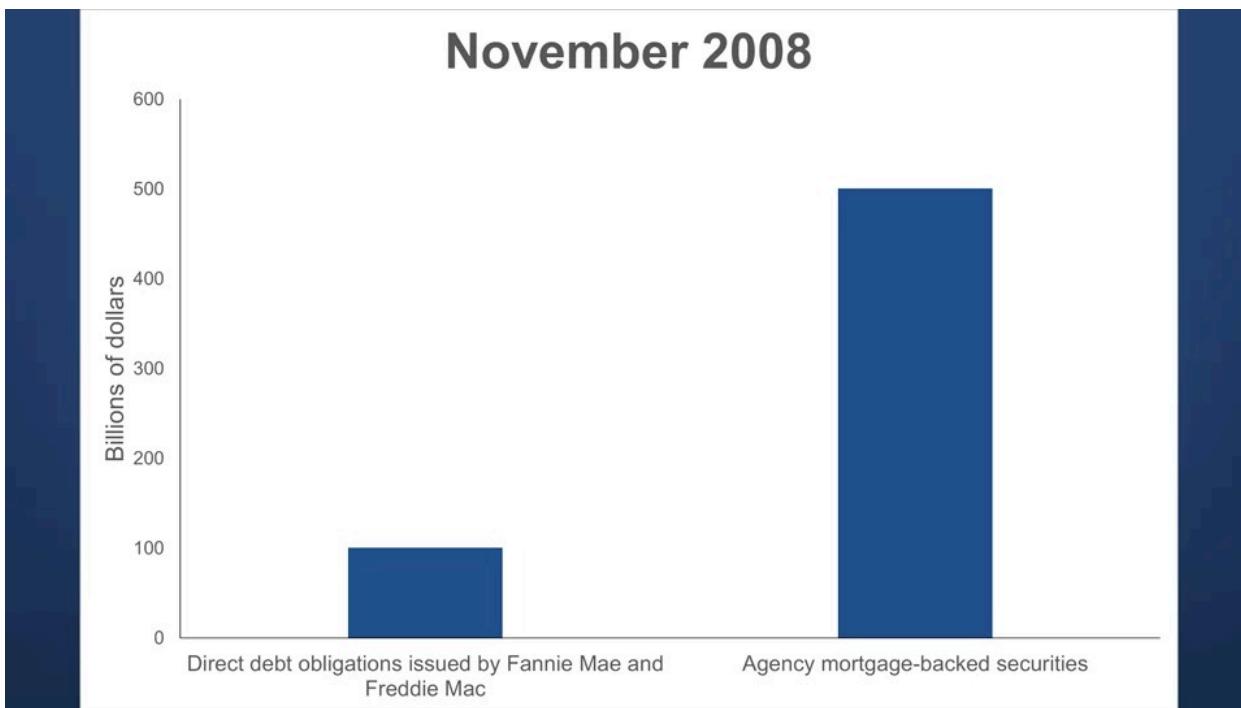
Lesson 2-3.2: Large-Scale Asset Purchases

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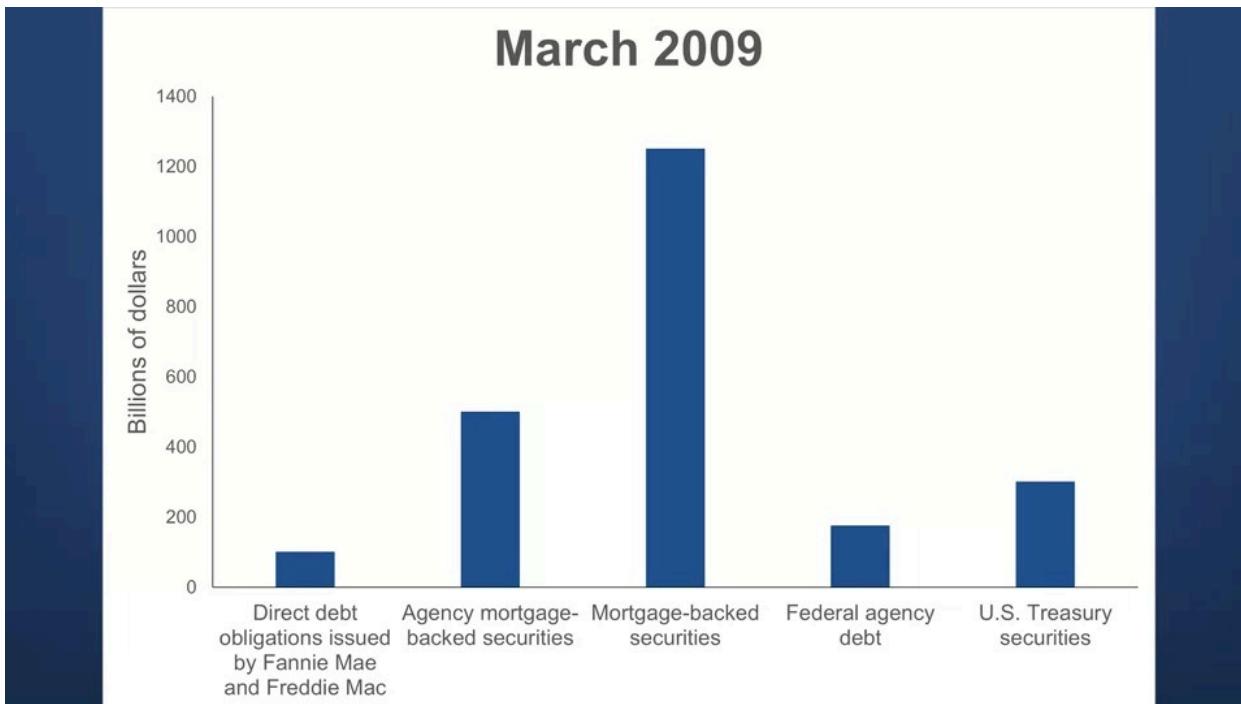
Large-Scale Asset Purchases

- Short-term interest rates close to zero
- Lowering short-term interest rates becomes ineffective

Hello and welcome to this lecture on large-scale asset purchases. In this class, we will examine this monetary policy tool that the Federal Reserve used for the first time during the 2008 financial crisis. We will discuss how large-scale asset purchases affect the economy. Traditional monetary policy acts only on short-term interest rates, such as the federal funds rate or the discount rate. The changes of the short-term interest rate then affect also longer-term interest rates, but to a lesser extent. In late 2008, the Federal Reserve's Open Market Committee wanted to stimulate the economy more, but the federal funds rate was already at zero, its effective lower bound. To be clear, negative nominal interest rates are an option that has been implemented, for instance in Sweden. But the effectiveness of the tool is still limited since nominal interest rates can only be pushed so far below zero. If the interest rate is pushed too far below zero, people can just hold cash. Instead of pushing short-term interest rates below zero, the Federal Reserve began purchasing longer-term securities through a series of large-scale asset purchases. Large-scale asset purchases, or LSAP, are often simply referred to as quantitative easing, or QE. They are a form of unconventional monetary policy designed to directly affect longer-term interest rates. The Federal Reserve implemented three large-scale asset purchase programs in the aftermath of the 2008 financial crisis.

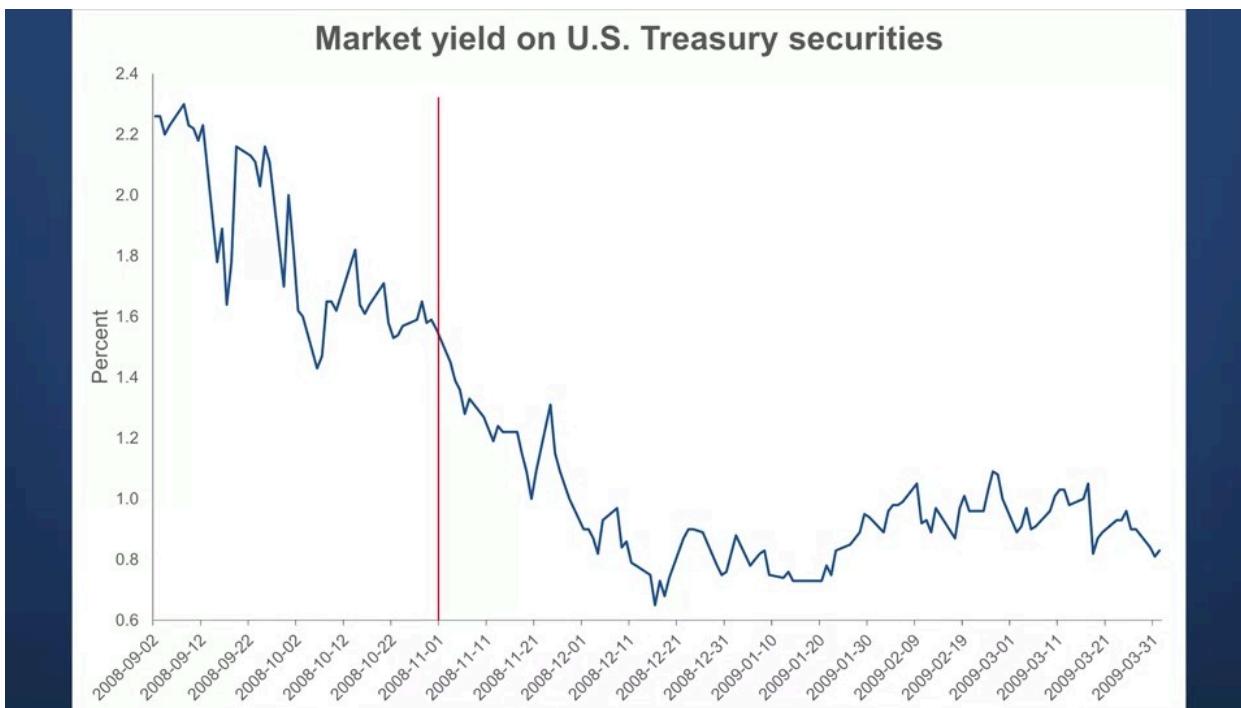


In November 2008, QE1 started. The Fed would buy up to 100 billion of direct debt obligation issued by government sponsored, and US Treasury backed enterprises, Fannie Mae and Freddie Mac, and 500 billion of agency mortgage-backed securities.

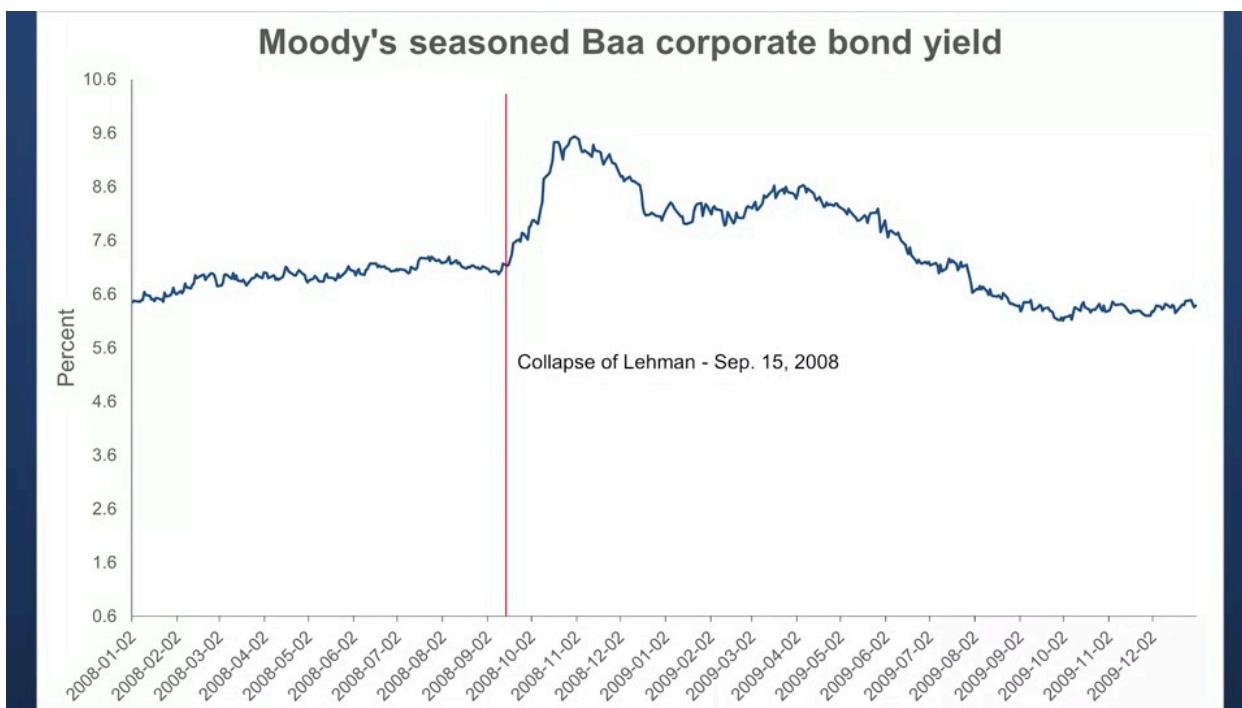


The program was expanded in March 2009. When it ended, the Fed had bought 1.25 trillion in mortgage-backed securities, 175 billion in federal agency debt, and 300 billion in US Treasury securities. These purchases acted like a large demand shock. Recall that there is an inverse relationship between yields and bond prices. By buying these

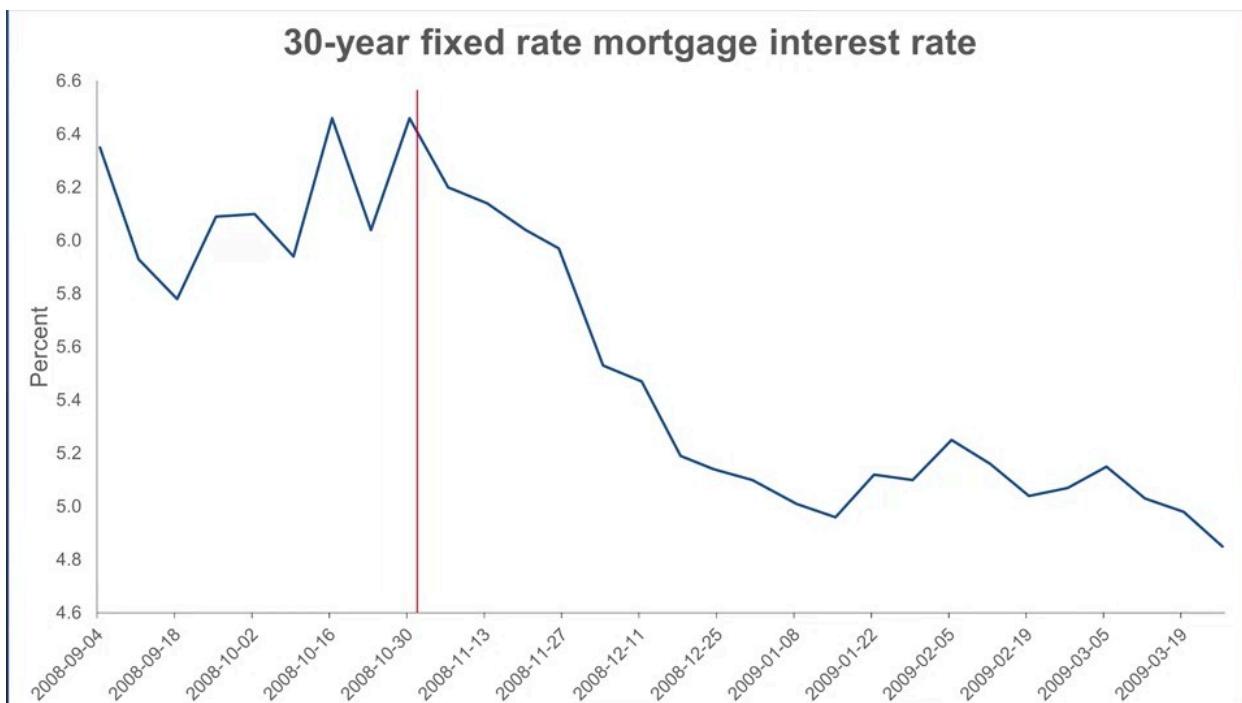
securities, the Federal Reserve reduced the yields on these securities, making them less attractive for investors, and cheaper to issue for borrowers.



The chart shows you the yield on two-year treasury securities. After the program was implemented, the yield dropped from 1.6% to 1%. With the yields on government securities declining, the Federal Reserve encouraged investors to buy riskier assets with higher yields, such as corporate bonds, and hence making more credit available to the economy.



Let's look at what happened to yields on corporate bonds, specifically bonds that were rated just investment grade. Yields had jumped from 7% to 9.5% after the collapse of Lehman on September 15th, 2008. However, with the QE1 program, yields dropped to about 8%, lowering the borrowing costs of corporations. Similarly, there's a close relationship between the yield on mortgage-backed securities and the mortgage rate.



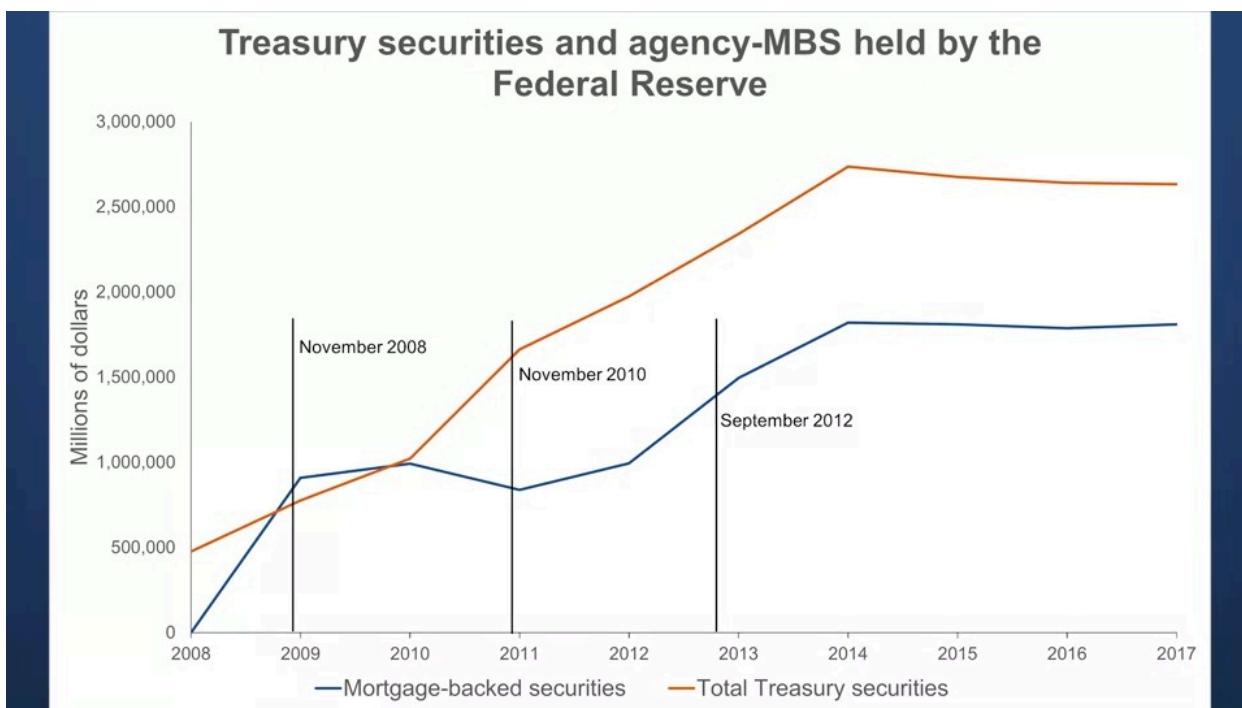
When the yields on mortgage-backed securities fall, then usually the mortgage rate falls as well. You can see in the chart that when the QE1 program started, the 30-year fixed

mortgage rate started to fall from almost 6.5% in late October 2008 to 4.85% in early April 2009. Lower market rate encouraged the purchases of homes. The second round of quantitative easing, or QE2, was announced in October 2010.

Quantitative Easing

- QE2 November 2010
- \$600 billion program
- Only long-term U.S. Treasury securities

Starting in November 2010, the Federal Reserve purchased 600 billion in long-term treasury securities. Again, the intent was to push down longer-term interest rates, which reduced the cost of credit to households and firms. The third and last round of quantitative easing, QE3, was announced in September 2012. This type was different because it was open-ended. The FOMC announced that every month the Federal Reserve would be purchasing 40 billion in agency mortgage-backed securities, and 45 billion in US Treasury securities. The FOMC announced that the purchasers would continue until the outlook for the labor market had improved substantially as long as inflation and expected inflation remains stable. In December 2013, the FOMC reduced the size of its asset purchases. The purchases were subsequently downsized, and the QE3 program concluded in October 2014.



You can see on the chart the impact of the programs on the Federal Reserve's balance sheet. By the end of 2014, the Federal Reserve held almost 2.5 trillion in US Treasury securities, and about 1.7 trillion in agency mortgage-backed securities. In between the QE programs, the Federal Reserve also announced the maturity extension program, or the twist. Between September 2011 and December 2012, the Federal Reserve bought 667 billion of treasury securities, with a remaining maturity between six and 30 years, and sold an equivalent value of treasury securities with remaining maturities of three years or less. This exchange did not include additional purchases. The size of the Federal Reserve balance sheet remained unchanged. The intent of the maturity extension program was to increase the downward pressure on longer-term interest rates. Large-scale asset purchases were also part of the Federal Reserve's response to the COVID-19 pandemic. On March 23rd, 2020, the FOMC announced that the Federal Reserve will continue to purchase treasury securities and agency mortgage-backed securities in the amounts needed to support smooth market functioning, and effective transmission of monetary policy to broader financial conditions. Later, the FOMC clarified that this program is open-ended.



Summary

- Policy rate at zero → Fed resorts to QE
- QE targets long-term interest rates directly
- QE reduces long-term borrowing costs for households and businesses

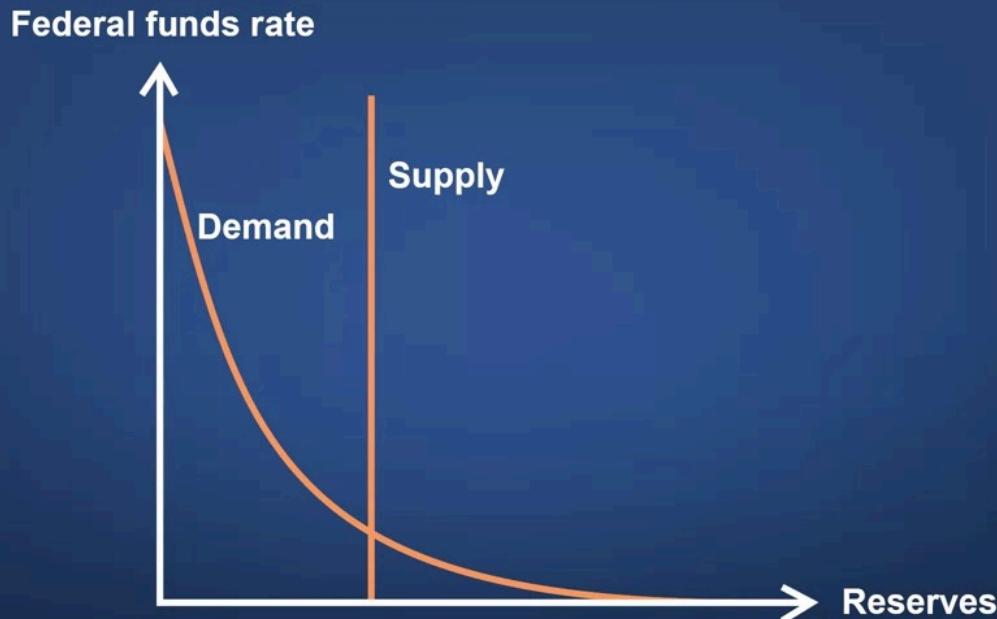
What have we learned in this lesson? First, in response to short-term interest rates being at zero percent, the Federal Reserve turned to large-scale asset purchases, or QE, to conduct monetary policy. Second, large-scale asset purchases can be targeted to affect long-term interest rates. Third, large-scale asset purchases reduce the cost of credit for consumers and corporations by lowering long-term interest rates.

Lesson 2-3.3: The Overnight Reverse Repurchase Agreement Facility

ONRRP

- OverNight Reverse RePurchase agreement facility
- Tool for policy normalization

Hello and welcome to this lecture on the Overnight Reverse Repurchase Agreement Facility or ONRRP. In this class, we will examine what the ONRRP is and why it was necessary as part of monetary policy normalization starting in 2014. We will also discuss how the ONRRP interacts with other funding markets. After setting the Federal funds rate to zero and engaging in large-scale asset purchases. After the 2008 financial crisis, the Federal Reserve intended to return to traditional monetary policy that is eventually increasing the federal funds rate. Historically, the Federal Reserve would conduct market operations, the buying and selling of securities to change the level of reserves that are traded in the federal funds market. When reserves are low, small changes in the supply of aggregate reserves would lead to adjustments in the federal funds rate.

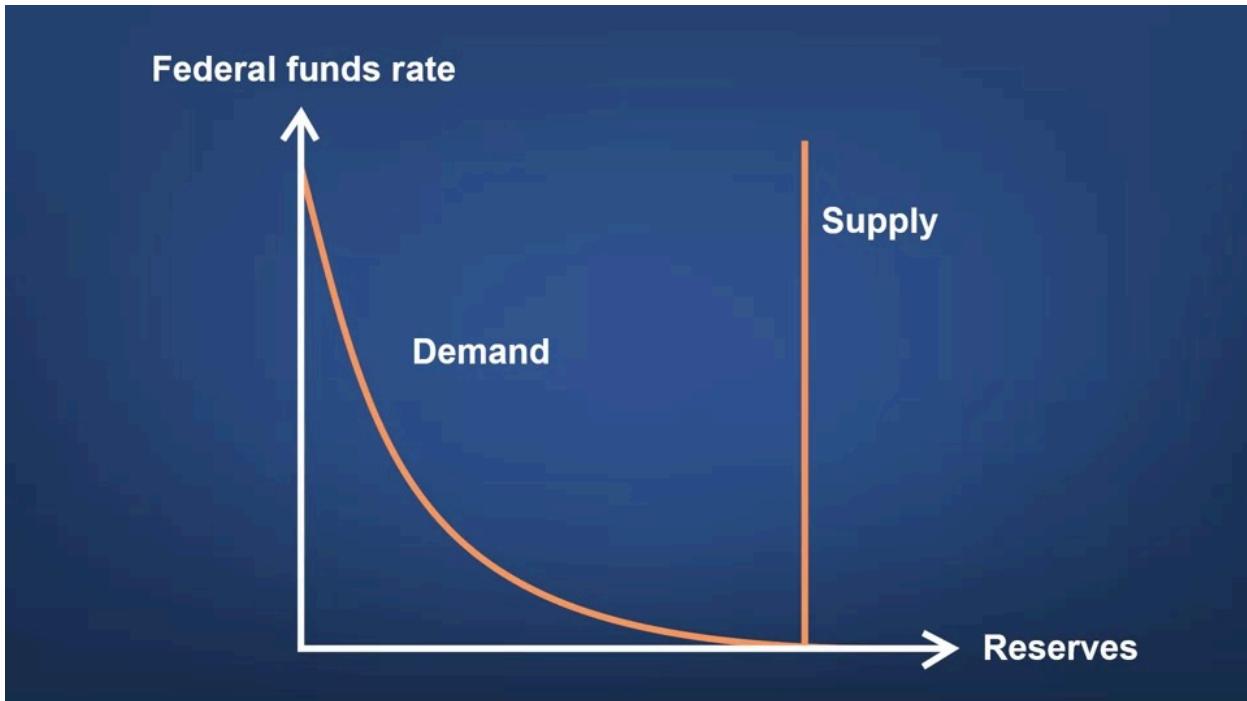


The figure illustrates the federal funds market in the pre financial crisis period. The federal funds rate is determined by the intersection of supply and demand. If the Federal Reserve Act to decrease the supply of reserves, shifting the supply to the left, then the federal funds rate increases. Similarly, an increase in the supply of reserves, shifting supply to the right, decreases federal funds. However, with the 2008 financial crisis, the Federal Reserve balance sheet had changed dramatically.

A simplified Federal Reserve balance sheet: Before and after the financial crisis (billions of dollars)			
Before: August 8, 2007		After: December 24, 2014	
	Assets	Liabilities	
Securities	791	Reserve balances	14
Other assets	78	Currency	777
		Other	45
		Capital	34
Total	869	Total	869
Securities	4,247	Reserve balances	2,610
Other assets	262	Currency	1,294
		Other	548
		Capital	57
Total	4,509	Total	4,509

Reserves had grown from 14 billion in 2007 to over 2.6 trillion in 2014. Small changes to

these large reserves were unlikely to change the federal funds rate and hence posed a challenge in 2014.



Let's look at the figure illustrating the federal funds market after the financial crisis with ample reserves and the federal funds rate of zero. As you can see, changes in the reserves would need to be quite large for the federal funds rate to respond. One option to reduce reserves would be to engage in large-scale asset sales as part of open-market operations.

Reduce Reserves

Large scale asset sale undesirable

- A) Price impact
- B) Spillover in other market

However, if the Federal Reserve sold off a large part of its portfolio in a short period of time, then this would cause prices of treasury securities to drop deeply. In turn, the resulting increase in yields on treasury securities would spill over into other markets, such as corporate bonds, leading to larger than intended changes in borrowing costs. Moreover, the price impact of large-scale asset sales would likely cause large disturbances in financial markets, something the Federal Reserve is trying to avoid. How would you construct an alternative? Here's the key idea.

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Goals

- A) Drain reserves**
- B) Provide lower bound for federal funds rate**
- C) Overnight cash market**
- D) No balance sheet impact**

To raise the federal funds rate, the Federal Reserve had to: A, drain a large amount of reserves. B, offer an interest rate on a different financial transaction that provides a lower bound for the federal funds rate. C, find a financial transaction whose characteristics are similar to the federal funds market. Specifically, it should be an overnight cash market. D, be able to carry out this transaction and not increase the balance sheet further.

Repo Market

- Fed borrows cash
- Treasury securities as collateral

The market that meets this requirement is the market for repurchase agreements or

repo market. Instead of selling the securities, the Federal Reserve decided to reduce reserves by borrowing cash in the repo market. More precisely, the Federal Reserve engaged in reverse repo agreements and used the treasury securities as collateral in repurchase agreements. We'll cover repurchase agreements in a different lecture. The following feature favored the creation of the Overnight Reverse Repo Facility or ONRRP.

ONRRP

- Large
- Overnight market
- Substitute for Federal Funds market
- Reduces reserves

First, the repo market is already very large so that the Federal Reserve would be a sizable but not an outside participant. Second, the repo market is mostly an overnight lending market that has already been a substitute to the federal funds market. Third, having bought 3.5 trillion of government and government backed debt securities during the large-scale asset purchase program, the Federal Reserve had enough security to offer as collateral for reverse repo transactions. The ONRRP would not increase the Reserve's balance sheet. Forth, it would be implemented to reduce reserves.

Effects of Reverse Repurchase Agreement on Balance Sheets

RRP Operations

Federal Reserve	Bank (RRP Counterparty)		
Repo Liability	\$100	Repo Asset	\$100
Bank Reserves	-\$100	Reserves	-\$100

Let's look at how the ONRRP reduces reserves. The Federal Reserve borrows cash from a bank in the repo market. The Federal Reserve does so by reducing the reserves of that bank and creating repo liability instead. For the bank's reserves drop on the asset side, but the new repo asset item is created instead. Hence the ONRRP works on two-dimensions.

ONRRP

- Provides floor for Federal Funds rate
- Reduces federal funds available

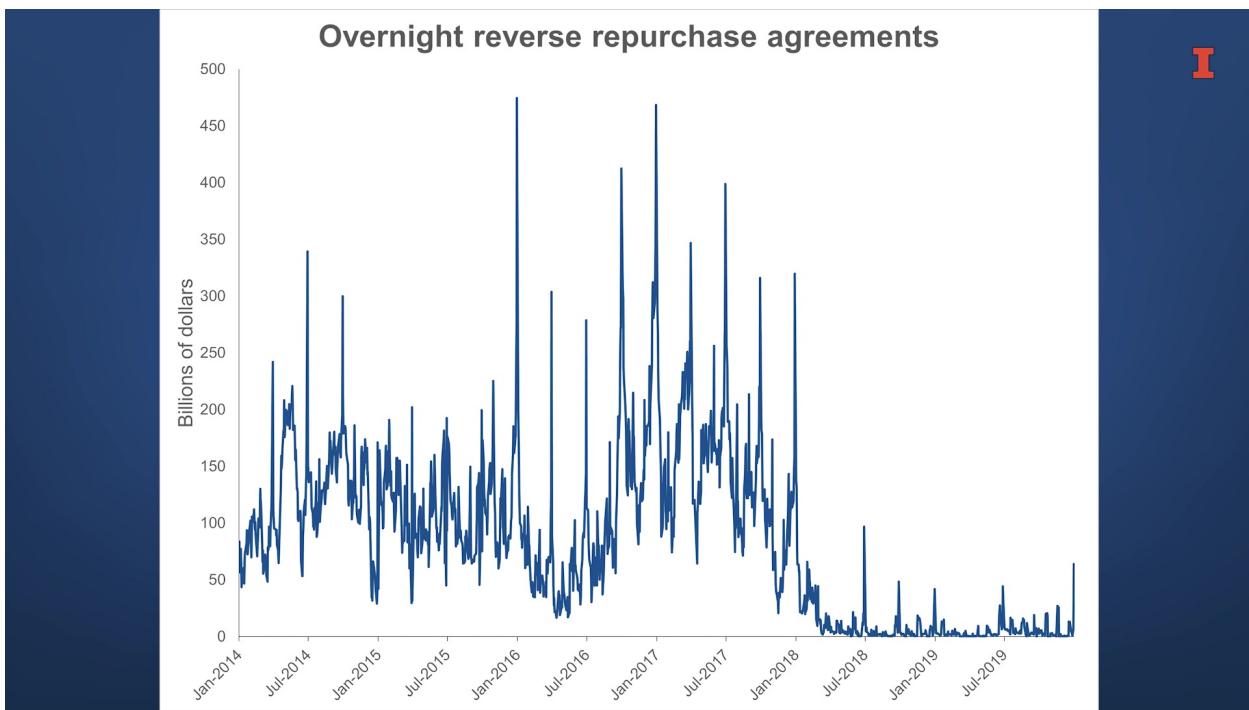
First, it offers an interest rate in a short-term funding market that is an alternative to the federal funds market. If the interest rate offered by the ONRRP is higher than the

Federal funds rate, the banks would use their reserves to lend to the ONRRP instead to the federal funds market. Suppose the federal funds rate is lower than the ONRRP rate, then a bank can buy federal funds and lend these funds to the ONRRP and receive the difference in the interest rates between the two markets. By offering an arbitrage opportunity, the ONRRP provides a lower bound for the federal funds rate. Second, the ONRRP, reduces the total amount of reserves available in the federal funds market. Banks will lend their excess reserves to the ONRRP up to the level where it is either better to sell reserves in the federal funds market or are needed for other short-term liquidity needs. In other words, the ONRRP reduces aggregate reserves to the level that the banking system needs for liquidity purposes only.

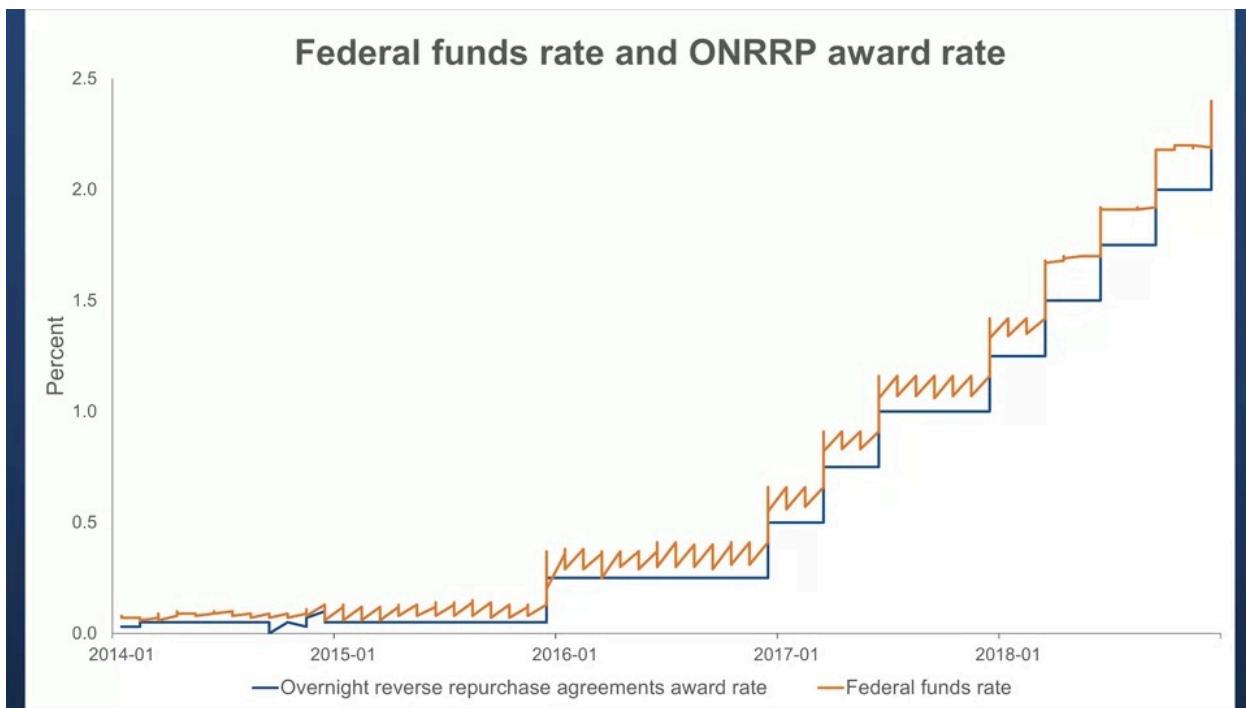
Money Market Mutual Funds

- Allowed to participate
- But through banks
- Also reduced reserves

In addition, the Federal Reserve offered money market mutual funds, the largest lender of cash to participate in these programs. Money market mutual funds do not have reserve accounts. Instead of dealing with money market mutual funds directly, the Federal Reserve debits the reserve accounts of the banks who act on behalf of the money market mutual funds. The bank can then debit the account of the money market mutual fund. However, going through banks, the Federal Reserve ensures that even if banks are unwilling to participate in the ONRRP, the money market mutual funds will take advantage of the program and thereby reduce banks reserves.



As you can see take-up in this program was substantial between 2014 and 2019. You will also notice spikes in this series. There are the quarter ends and the year ends. Financial institutions do not want to report large exposures to money market mutual funds as it is fragile funding. They change their balance sheet on quarter and year end. This is called window dressing, which leaves money market mutual funds with large amounts of cash to lend. The ONRRP absorbs these large increases in the cash supply. Was the ONRRP helpful for increases in the federal funds rate?



Let's look at this chart that shows the ONRRP award rate, the rate that the Federal Reserve paid for borrowing cash, and the federal funds rate. As you can see, both rates track each other really well. This means that the ONRRP, help the Federal Reserve to increase the federal funds rate at the time of ample reserves. When traditional ways of reducing reserves would have failed to increase the federal funds rate.

Summary

- Post-2008, too many bank reserves
- Traditional monetary policy (e.g., OMO) might not work
- Fed can drain reserves via repo market
- ONRRP rate sets lower bound on Fed Funds rate

What have we learned in this lesson? First, when there are a lot of reserves, traditional monetary policy may fail to increase interest rates. Second, the Federal Reserve

borrowed cash in the repo market to reduce reserves in the post financial crisis period. Third, interest rate offered by the Federal Reserve in the repo market provide a lower bound to the federal funds rate.