Tools of Monetary Policy

Chapter 15

Econ 351 – Monetary Economics

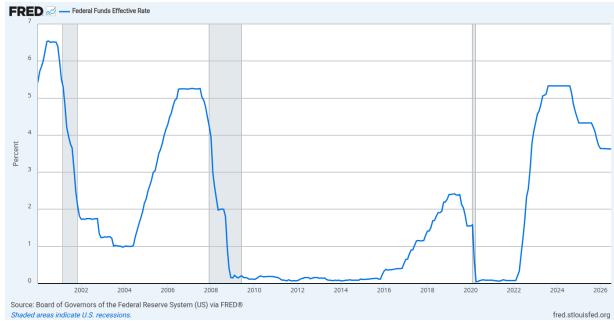
University of Tennessee, Knoxville

August 24, 2026

Preview

This chapter examines the tools used by the Fed to control the money supply and interest rates.

The federal funds rate is the Fed's main policy target. The tools studied here – open market operations, discount lending, reserve requirements, and interest on reserves – are how the Fed moves it.



Effective federal funds rate, 2000–2026: cut to near zero in 2008 and 2020, raised sharply in 2022–23.

Source: FRED, Federal Reserve Bank of St. Louis

Outline

Market for Reserves and the Federal Funds Rate

Conventional Monetary Policy Tools

Unconventional Monetary Policy Tools

The Market for Reserves and the Federal Funds Rate

Demand and Supply in the Market for Reserves

- **Demand** for reserves: required reserves + excess reserves (chosen by banks)
- **Supply** of reserves: nonborrowed reserves NBR (open market operations) + borrowed reserves BR (discount loans)
- The price that clears this market is the **federal funds rate** i_{ff}

Key Question

What happens to the quantity of reserves demanded by banks, holding everything else constant, as the federal funds rate i_{ff} changes?

Federal Funds Rate

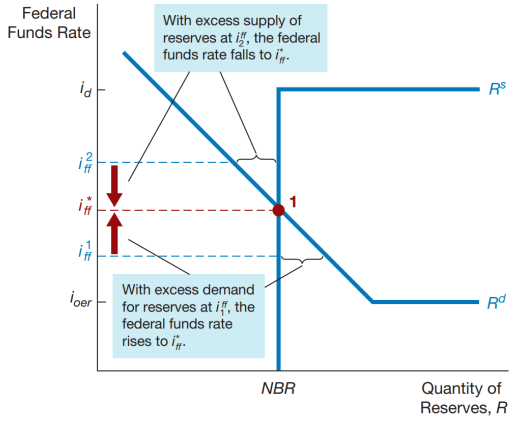
The **federal funds rate** is the overnight interest rate at which banks lend reserves to each other.

- Banks must hold reserves (cash) at the Fed
- Sometimes they have too much $\rightarrow$ they lend
- Sometimes they have too little $\rightarrow$ they borrow
- The interest rate on these overnight loans = federal funds rate

Who Sets It?

- Set as a **target range** by the Federal Open Market Committee (FOMC)
- The Federal Reserve uses tools to keep the market rate within this range

Equilibrium in the Market for Reserves



Equilibrium in the market for reserves: demand slopes down until it flattens at i_{oer}; supply is vertical at *NBR* and flat at i_d.

Mishkin, The Economics of Money, Banking, and Financial Markets

Demand in the Market for Reserves

Components of Reserve Demand

Required Reserves

- Determined by the required reserve ratio.
- Depends on the total amount of deposits held by banks.

Excess Reserves

- Additional reserves that banks choose to hold.
- Serve as a safeguard against unexpected deposit outflows.

Opportunity Cost of Holding Excess Reserves

The cost of holding excess reserves equals the difference between:

- The federal funds rate (potential earnings from lending reserves).
- The interest on excess reserves paid by the Fed (i_{oer}).

Demand in the Market for Reserves

Case 1: When the federal funds rate $i_{ff} > i_{oer}$

- Lowering the federal funds rate reduces the opportunity cost of holding excess reserves.
- Banks demand more reserves.
- This produces a **downward-sloping reserve demand curve** (R_d).

Case 2: When the federal funds rate $i_{ff} \leq i_{oer}$

- Banks stop lending reserves at lower rates.
- Banks accumulate excess reserves instead.
- The demand curve becomes **flat (perfectly elastic)** at i_{oer}.

Supply in the Market for Reserves

Components of Reserve Supply

Nonborrowed Reserves (NBR)

- Supplied by the Federal Reserve.
- Created mainly through open market operations.

Borrowed Reserves (BR)

- Funds borrowed by banks from the Federal Reserve.
- Obtained through discount loans at the discount window.

Role of the Discount Rate (i_d)

- The Federal Reserve typically sets the discount rate above the federal funds rate target.
- The discount rate influences banks' decisions about whether to borrow reserves from the Fed.

Supply in the Market for Reserves

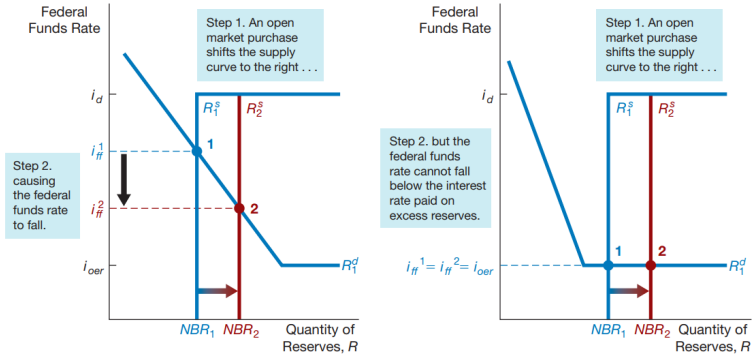
When the Federal Funds Rate $i_{ff} < i_d$

- Borrowing from the Fed is more expensive than borrowing in the federal funds market.
- Banks avoid borrowing from the Fed.
- Borrowed reserves (BR) $= 0$.
- Total reserves equal nonborrowed reserves (NBR).
- The supply curve is **vertical at** NBR.

When the Federal Funds Rate $i_{ff} \geq i_d$

- Banks borrow reserves from the Fed at the discount rate.
- The federal funds rate cannot rise above the discount rate.
- The supply curve becomes **flat (perfectly elastic)** at i_d.

Response to an Open Market Operation



An open market purchase shifts supply right: i_{ff} falls (panel a) unless it is already at the floor i_{oer} (panel b).

Mishkin, The Economics of Money, Banking, and Financial Markets

Response to an Open Market Operation

The effect of an open market operation depends on where the supply curve initially intersects the reserve demand curve:

- The **downward-sloping section**
- The **flat section**

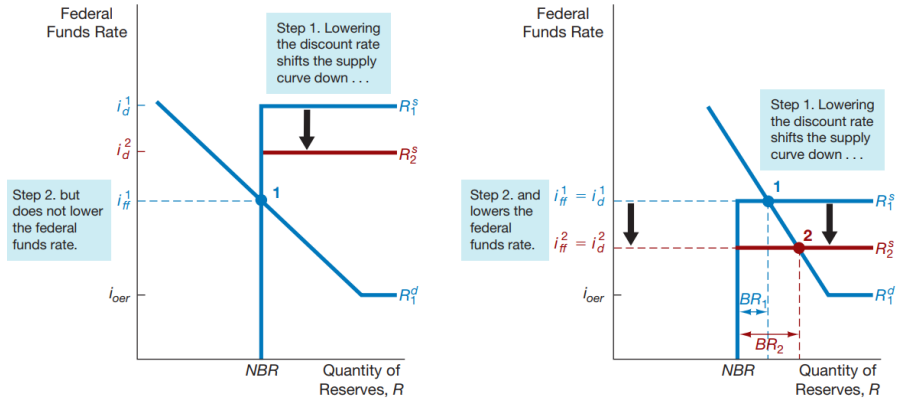
When the Intersection is on the Downward-Sloping Section

- An **open market purchase** increases reserves and lowers the federal funds rate.
- An **open market sale** decreases reserves and raises the federal funds rate.

When the Intersection is on the Flat Section

- Open market operations change the quantity of reserves.
- But they **do not change the federal funds rate**.
- The federal funds rate remains pinned at the flat portion of the demand curve.

Response to a Change in the Discount Rate

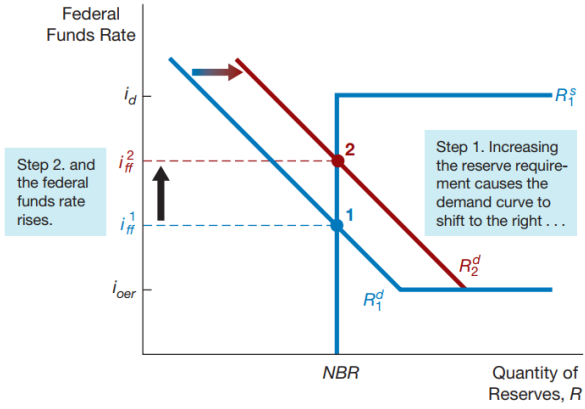


(a) No discount lending ($BR = 0$) (b) Some discount lending ($BR > 0$)

A cut in the discount rate has no effect on the vertical section of supply (a), but lowers i_{ff} when banks are borrowing (b).

Mishkin, The Economics of Money, Banking, and Financial Markets

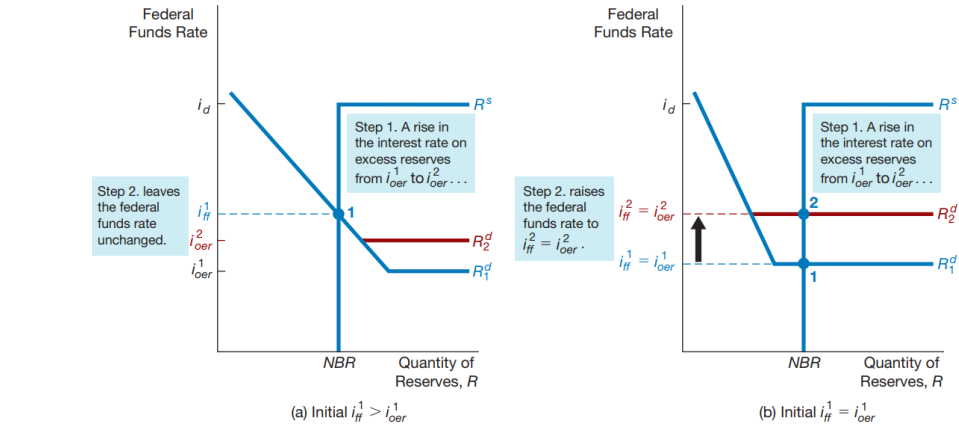
Response to a Change in Required Reserve



A rise in reserve requirements shifts reserve demand right and raises the federal funds rate.

Mishkin, The Economics of Money, Banking, and Financial Markets

Response to a Change in the Interest Rate on Reserves



A rise in the interest rate on reserves lifts the floor of the demand curve; i_{ff} rises when it sits on the floor (b).

Mishkin, The Economics of Money, Banking, and Financial Markets

Response to a Change in the Discount Rate

Case 1: Intersection on the Vertical Section of Supply

- If the equilibrium occurs on the **vertical section of the supply curve**, a change in the discount rate has **no effect** on the federal funds rate.

Case 2: Intersection on the Horizontal Section of Supply

- The federal funds rate may **rise or fall** depending on whether the discount rate increases or decreases.

Effect of Reserve Requirement Changes

- When the Fed **raises reserve requirements**, the federal funds rate rises.
- When the Fed **lowers reserve requirements**, the federal funds rate falls.

Application: Limiting Fluctuations in the Federal Funds Rate

Supply and demand analysis in the reserve market shows an important advantage of the Federal Reserve's operating procedures.

Role of Current Fed Policies

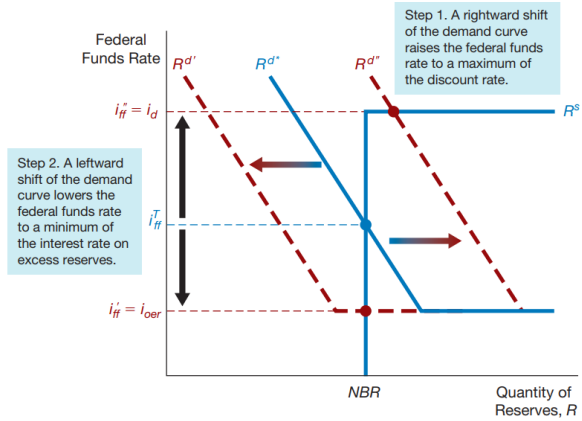
- The Fed operates the **discount window**.
- The Fed pays **interest on reserves**.

These policies create bounds that stabilize the federal funds rate.

Economic Implication

As a result, the Federal Reserve's operating framework **limits fluctuations in the federal funds rate**.

How Fed Procedures Limit Fluctuations in the Funds Rate



Discount lending caps the funds rate at i_d and interest on reserves puts a floor at i_{oer}.

Mishkin, The Economics of Money, Banking, and Financial Markets

Outline

Market for Reserves and the Federal Funds Rate

Conventional Monetary Policy Tools

Unconventional Monetary Policy Tools

Conventional Monetary Policy Tools

During normal times, the Federal Reserve uses three main tools to conduct monetary policy.

Three Conventional Monetary Policy Tools

- **Open Market Operations**
- **Discount Lending**
- **Reserve Requirements**

These tools are used to influence:

- the **money supply**
- **short-term interest rates**

Open Market Operations (OMOs)

What they do

Buying or selling **government securities** changes the **reserve level** and the **monetary base**, and thereby the **money supply** and **short-term interest rates**.

Types of Transactions

- **Open Market Purchase**
  - Expands reserves and the monetary base
  - Increases the money supply
- **Open Market Sale**
  - Reduces reserves and the monetary base
  - Decreases the money supply

Types of Open Market Operations

Dynamic Open Market Operations

Goal:

- Adjust the long-term level of reserves
- Respond to economic cycles

Method: Permanent purchases or sales of securities

Defensive Open Market Operations

Goal:

- Offset temporary disturbances in reserves
- Examples: Treasury deposits or float fluctuations

Tools:

- **Repurchase Agreements (Repos)** Fed buys securities temporarily $\rightarrow$ injects liquidity
- **Reverse Repos** Fed sells securities temporarily $\rightarrow$ withdraws liquidity

Who Carries Out Open Market Operations?

Decision-Making and Execution Mechanism

- **Federal Open Market Committee (FOMC)** Sets the target for the federal funds rate.
- **New York Fed Trading Desk** Executes open market operations using the TRAPS system (Trading Room Automated Processing System).
- **Participants** Transactions occur with **primary dealers** (large financial institutions).



Federal Reserve Bank of New York – home of the trading desk that executes open market operations.

Wikimedia Commons, Beyond My Ken, CC BY-SA 4.0

Discount Policy and the Lender of Last Resort

Discount Window

Banks can borrow reserves directly from the Federal Reserve through the **discount window**.

Lender of Last Resort

The Fed acts as a **lender of last resort** to prevent financial panics.

- This safety net may create a **moral hazard problem**.

Policy Response: Using Discount Policy to Prevent a Panic

To prevent the collapse of the financial system, the Federal Reserve can provide liquidity to the banking system.

Example and Result

The Chairman of the Board of Governors announced that the Fed was ready to provide liquidity to support the financial system: banks obtained discount loans, markets stabilized, and a potential panic was prevented.

Reserve Requirements

Institutional Framework

The Depository Institutions Deregulation and Monetary Control Act of 1980 established a uniform reserve requirement for all depository institutions.

Current Reserve Requirement Structure

- First \$15.5 million of checkable deposits $\rightarrow$ **0%**
- \$15.5 million to \$115.1 million $\rightarrow$ **3%**
- Deposits above \$115.1 million $\rightarrow$ **10%**

The Fed can vary the 10% requirement between **8% and 14%**.

Interest on Excess Reserves

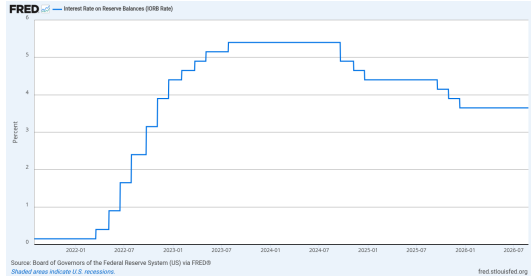
The Federal Reserve began paying interest on excess reserves in **2008**.

Role During Financial Crisis

- Banks accumulated large quantities of excess reserves.
- Paying interest on reserves allowed the Fed to maintain control over the **federal funds rate**.

Policy Implication

Interest on excess reserves became an important tool for stabilizing short-term interest rates.



Interest rate on reserve balances (IORB), 2021–2026: it moves in lockstep with the FOMC's target range.

Source: FRED, Federal Reserve Bank of St. Louis

Relative Advantages of Monetary Policy Tools

Open market operations are the **primary monetary policy tool** because they are:

- Flexible
- Precise
- Easily reversed
- Quickly implemented

Discount Lending

- Less frequently used as a policy tool.
- Can create uncertainty and liquidity concerns for banks.
- Still valuable because it allows the Fed to act as a **lender of last resort**.

Outline

Market for Reserves and the Federal Funds Rate

Conventional Monetary Policy Tools

Unconventional Monetary Policy Tools

Why Conventional Tools Fail in a Financial Panic

Main Idea

When the economy experiences a **full-scale financial crisis**, conventional monetary policy tools may no longer work effectively.

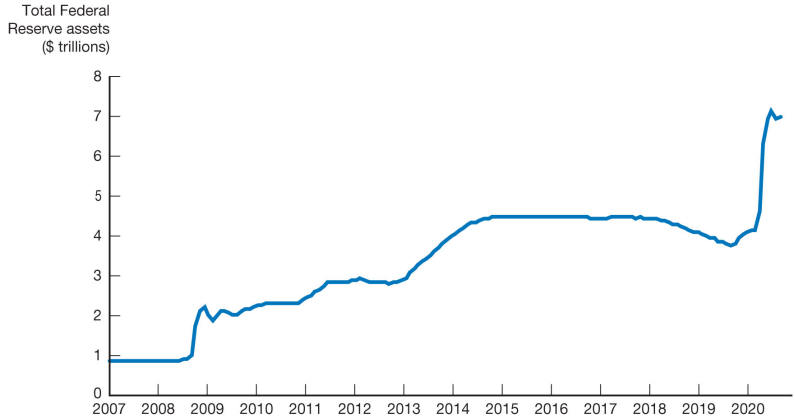
Reason 1: Breakdown of the Financial System

- Financial markets may seize up.
- The financial system becomes **unable to allocate capital to productive uses**.
- Investment spending falls and the economy contracts.

Reason 2: Zero Lower Bound Problem

- A severe negative shock can push interest rates close to zero.
- Once the **zero lower bound** is reached, conventional monetary policy loses effectiveness.

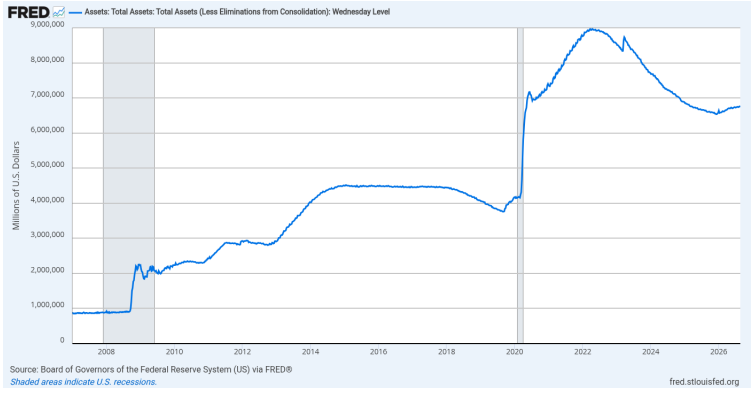
The Expansion of the Fed's Balance Sheet, 2007–2020



Total assets of the Federal Reserve, 2007–2020 (billions of dollars).

Mishkin, The Economics of Money, Banking, and Financial Markets

The Fed's Balance Sheet Today



Total assets of the Federal Reserve, 2007–2026 (millions of dollars): three rounds of quantitative easing after 2008, a second surge in 2020, and gradual balance-sheet reduction since 2022.

Source: FRED, Federal Reserve Bank of St. Louis

Unconventional Tools in the Financial Crisis (1/2)

Quantitative Easing vs. Credit Easing

During the global financial crisis, the Federal Reserve created a variety of new lending facilities to restore liquidity to different parts of the financial system.

- **Quantitative Easing (QE)** Large-scale asset purchases to increase reserves and lower long-term interest rates.
- **Credit Easing** Targeted interventions designed to improve credit conditions in specific markets.

Forward Guidance

- The Fed committed to keeping the federal funds rate near zero for an extended period.
- This lowered expectations of future short-term interest rates.
- As a result, **long-term interest rates declined**.

Unconventional Tools in the Financial Crisis (2/2)

Negative Interest Rates on Bank Deposits

Central banks may set negative interest rates on reserves held by banks at the central bank.

Economic Mechanism

- Banks are discouraged from holding excess reserves.
- Banks are encouraged to lend more to households and businesses.
- Increased lending can stimulate economic activity.



European Central Bank, Frankfurt – the ECB charged banks a negative rate on deposits from 2014 to 2022.

Wikimedia Commons, DXR, CC BY-SA 4.0

Policy Debate

- Some economists question whether negative interest rates have strong expansionary effects.

Chapter summary

- The federal funds rate is set by supply and demand in the market for reserves: demand slopes down until the floor i_{oer}; supply is vertical at NBR until the ceiling i_d.
- Open market purchases lower i_{ff} (unless it is at the floor); higher reserve requirements raise it; discount rate changes matter only when banks are borrowing.
- Discount lending and interest on reserves bound the federal funds rate and limit its fluctuations.
- Open market operations are the primary tool because they are flexible, precise, easily reversed, and fast; the discount window remains vital as the lender of last resort.
- In a crisis or at the zero lower bound the Fed turns to unconventional tools: quantitative easing, credit easing, forward guidance, and (abroad) negative interest rates.