

Economics of Financial Markets – Lecture 10

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Preview

- We study how commercial banks create deposits and describes the basic principles of the money supply creation process
- We examine the tools used by the Federal Reserve System to control the money supply and interest rates

Learning Objectives

- Illustrate the market for reserves and demonstrate how changes in monetary policy can affect the federal funds rate.
- Summarize how conventional monetary policy tools are implemented and the advantages and limitations of each tool.

Factors that Determine the Money Supply

- Changes in the nonborrowed monetary base MB_n
 - The money supply is **positively** related to the non-borrowed monetary base MB_n
- Changes in borrowed reserves from the Fed
 - The money supply is **positively** related to the level of borrowed reserves, BR , from the Fed

Factors that Determine the Money Supply

- Changes in the required reserves ratio
 - The money supply is **negatively** related to the required reserve ratio.
- Changes in currency holdings
 - The money supply is **negatively** related to currency holdings.
- Changes in excess reserves
 - The money supply is **negatively** related to the amount of excess reserves.

The Money Multiplier

- Define money as currency plus checkable deposits: M1
- Link the money supply (M) to the monetary base (MB) and let m be the money multiplier

$$M = m \times MB$$

Deriving the Money Multiplier

- Assume that the desired holdings of currency C and excess reserves ER grow proportionally with checkable deposits D .
- Then,

$c = \{C/D\}$ = currency ratio

$e = \{ER/D\}$ = excess reserves ratio

Deriving the Money Multiplier

The total amount of reserves (R) equals the sum of required reserves (RR) and excess reserves (ER).

$$R = RR + ER$$

The total amount of required reserves equals the required reserve ratio times the amount of checkable deposits

$$RR = r \times D$$

Substituting for RR in the first equation

$$R = (r \times D) + ER$$

The Fed sets r to less than 1

Deriving the Money Multiplier

- The monetary base MB equals currency (C) plus reserves (R):

$$MB = C + R = C + (r \times D) + ER$$

- Equation reveals the amount of the monetary base needed to support the existing amounts of checkable deposits, currency and excess reserves.

Deriving the Money Multiplier

$$c = \{ C / D \} \Rightarrow C = c \times D \text{ and}$$

$$e = \{ E R / D \} \Rightarrow E R = e \times D$$

Substituting in the previous equation

$$M B = (r \times D) + (e \times D) + (c \times D) = (r + e + c) \times D$$

Divide both sides by the term in parentheses

$$D = \frac{1}{r + e + c} \times M B$$

$$M = D + C \text{ and } C = c \times D$$

$$M = D + (c \times D) = (1 + c) \times D$$

Substituting again

$$M = \frac{1 + c}{r + e + c} \times M B$$

The money multiplier is then

$$m = \frac{1 + c}{r + e + c}$$

Intuition Behind the Money Multiplier

$$r = \text{required reserve ratio} = 0.10$$

$$C = \text{currency in circulation} = \$400 \text{ B}$$

$$D = \text{checkable deposits} = \$800 \text{ B}$$

$$ER = \text{excess reserves} = \$0.8 \text{ B}$$

$$M = \text{money supply (M1)} = C + D = \$1,200 \text{ B}$$

$$c = \frac{\$400 \text{ B}}{\$800 \text{ B}} = 0.5$$

$$e = \frac{\$0.8 \text{ B}}{\$800 \text{ B}} = 0.001$$

$$m = \frac{1 + 0.5}{0.1 + 0.001 + 0.5} = \frac{1.5}{0.601} = 2.5$$

This is less than the simple deposit multiplier
Although there is multiple expansion of deposits,
there is no such expansion for currency

Suppose that the required reserve ratio is 9%, currency in circulation is \$620 billion, the amount of checkable deposits is \$950 billion, and excess reserves are \$15 billion.

(a) Calculate the money supply, the currency deposit ratio, the excess reserve ratio, and the money multiplier.

Answer: The money supply is \$ 1,570 billion (round your response to the nearest whole number). The currency deposit ratio is 0.653 (round your response to three decimal places). The excess reserves ratio is 0.016 (round your response to three decimal places). The money multiplier is 2.18 (round your response to two decimal places).

Question Continued

(b) Suppose the central bank conducts an unusually large open market purchase of bonds held by banks of \$ 1,300 billion due to a sharp contraction in the economy. Assuming the ratios you calculated in part (a) remain the same, predict the effect on the money supply.

Answer: Assuming the ratios calculated in the previous steps are the same, the money supply should increase to \$ 4,405 billion (round your response to the nearest whole number).

The Market For Reserves and the Federal Funds Rate

- Demand and Supply in the Market for Reserves
- What happens to the quantity of reserves demanded by banks, holding everything else constant, as the federal funds rate changes?
- Excess reserves are insurance against deposit outflows
 - The cost of holding these is the interest rate that could have been earned minus the interest rate that is paid on these reserves, i_{or}

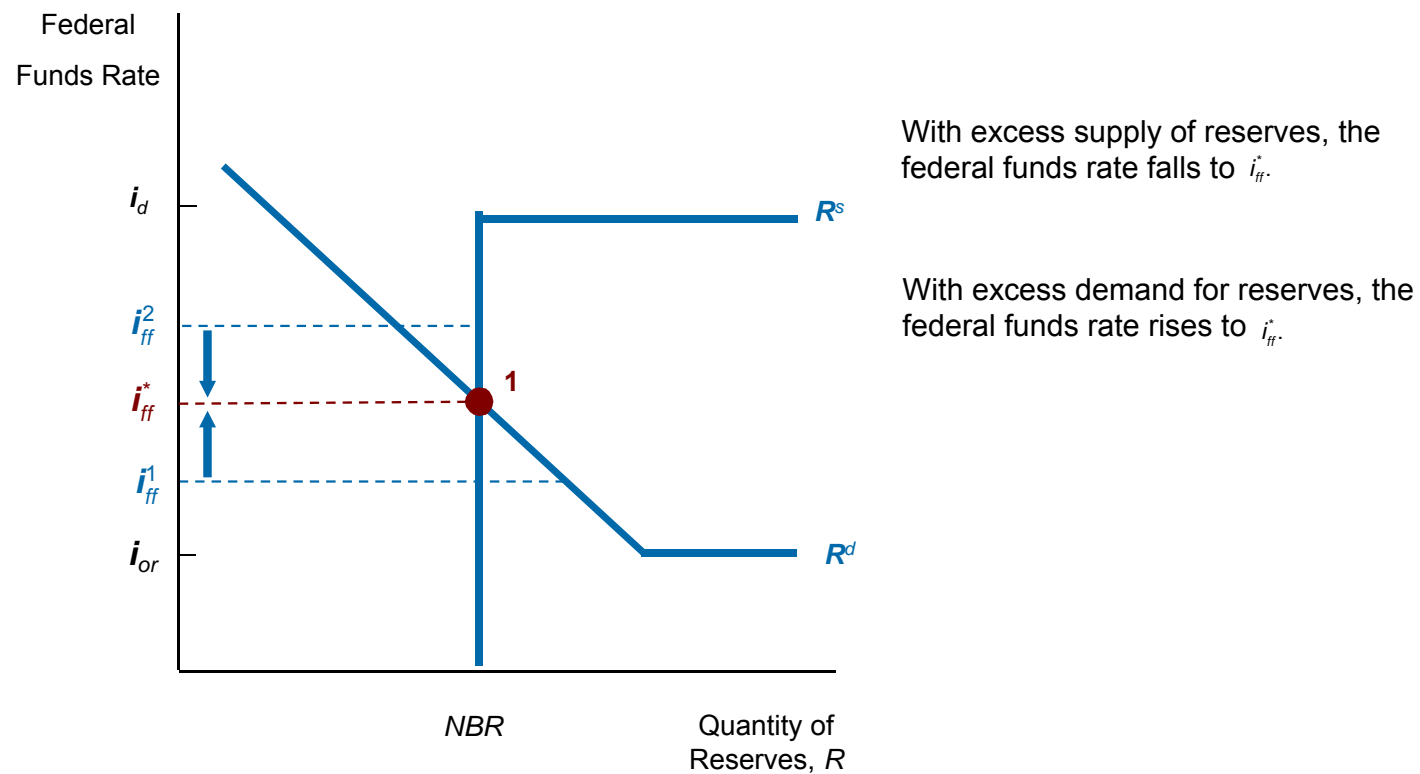
Demand in the Market for Reserves

- Since the fall of 2008 the Fed has paid interest on reserves at a level that is set at a fixed amount below the federal funds rate target.
- When the federal funds rate is above the rate paid on excess reserves, i_{or} , as the federal funds rate decreases, the opportunity cost of holding excess reserves falls and the quantity of reserves demanded rises.
- Downward sloping demand curve that becomes flat (infinitely elastic) at i_{or}

Supply in the Market for Reserves

- Two components: non-borrowed and borrowed reserves
- Cost of borrowing from the Fed is the discount rate
- Borrowing from the Fed is a substitute for borrowing from other banks
- If $i_{ff} < i_d$, then banks will not borrow from the Fed and borrowed reserves are zero
- The supply curve will be vertical
- As i_{ff} rises above i_d , banks will borrow more and more at i_d and re-lend at i_{ff}
- The supply curve is horizontal (perfectly elastic) at i_d

Figure 1 Equilibrium in the Market for Reserves



How Changes in the Tools of Monetary Policy Affect the Federal Funds Rate

- Effects of open an market operation depends on whether the supply curve initially intersects the demand curve in its **downward sloped section versus its flat section**.
- An open market **purchase** causes the federal funds rate to **fall** whereas an open market **sale** causes the federal funds rate to **rise** (when intersection occurs at the downward sloped section).

How Changes in the Tools of Monetary Policy Affect the Federal Funds Rate

- Open market operations have **no effect** on the federal funds rate when intersection occurs at the **flat** section of the demand curve.
- If the intersection of supply and demand occurs on the **vertical** section of the supply curve, a change in the discount rate will have **no effect** on the federal funds rate.

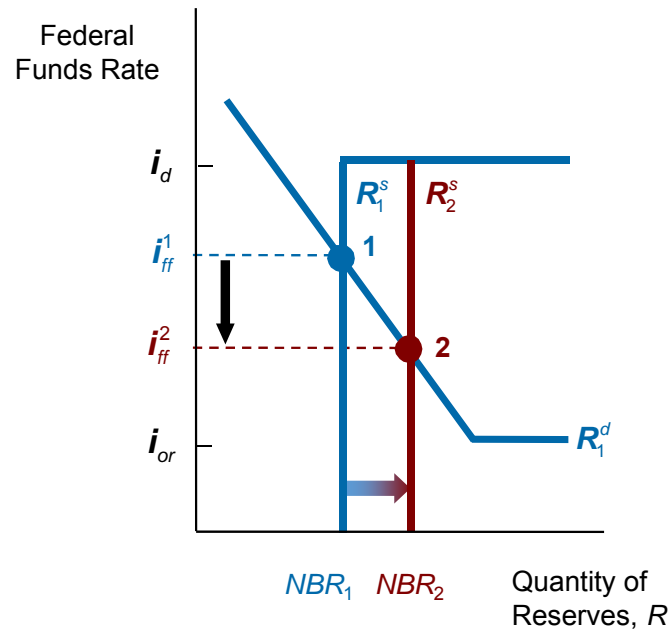
How Changes in the Tools of Monetary Policy Affect the Federal Funds Rate

- If the intersection of supply and demand occurs on the **horizontal** section of the supply curve, a change in the discount rate shifts that portion of the supply curve and the federal funds rate may either **rise or fall** depending on the change in the discount rate.

How Changes in the Tools of Monetary Policy Affect the Federal Funds Rate

- When the Fed **raises** reserve requirement, the federal funds rate **risers** and when the Fed **decreases** reserve requirement, the federal funds rate **falls**.

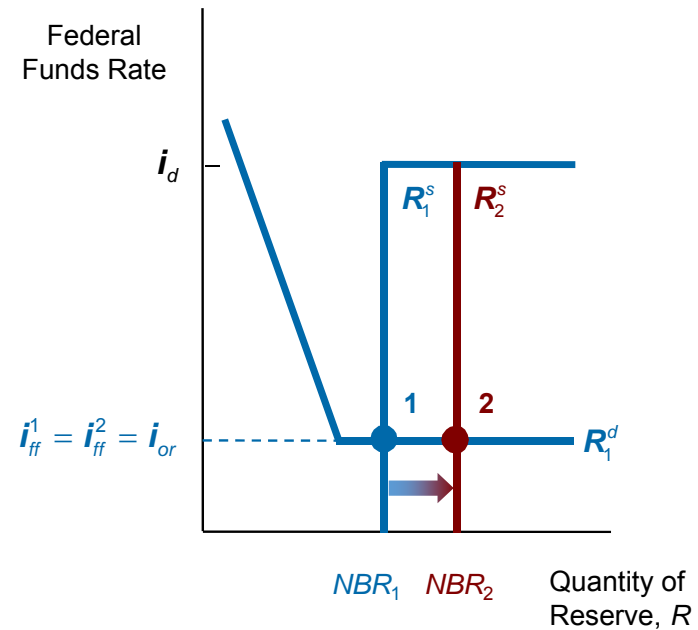
Figure 2 Response to an Open Market Operation



Step 1. An open market purchase shifts the supply curve to the right ...

Step 2. causing the federal funds rate to fall.

(a) Supply curve initially intersects demand curve in its downward-sloping section

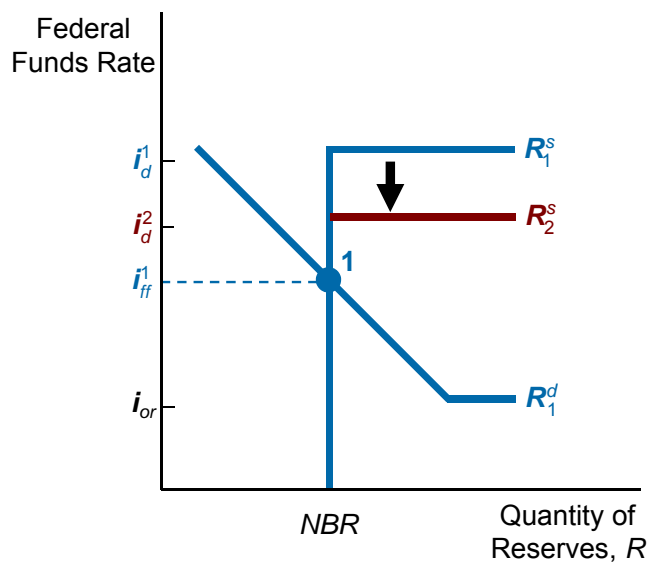


Step 1. An open market purchase shifts the supply curve to the right ...

Step 2. but the federal funds rate cannot fall below the interest rate paid on reserves.

(b) Supply curve initially intersects demand curve in its flat section

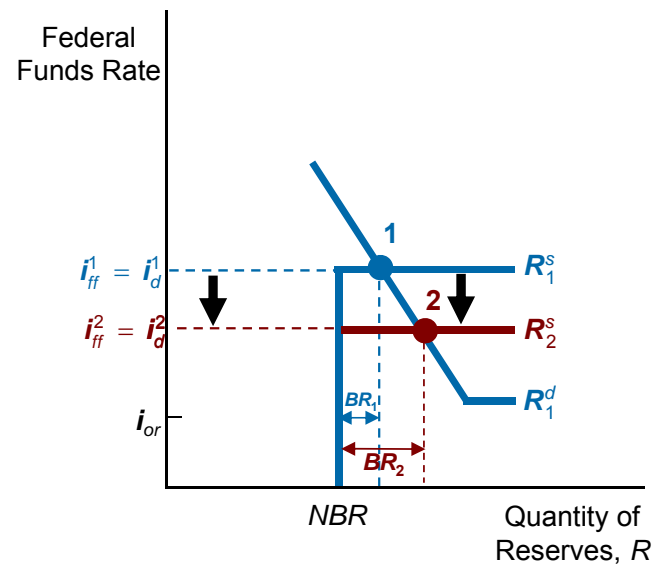
Figure 3 Response to a Change in the Discount Rate



Step 1. Lowering the discount rate shifts the supply curve down...

Step 2. but does not lower the federal funds rate.

(a) No discount lending ($BR = 0$)

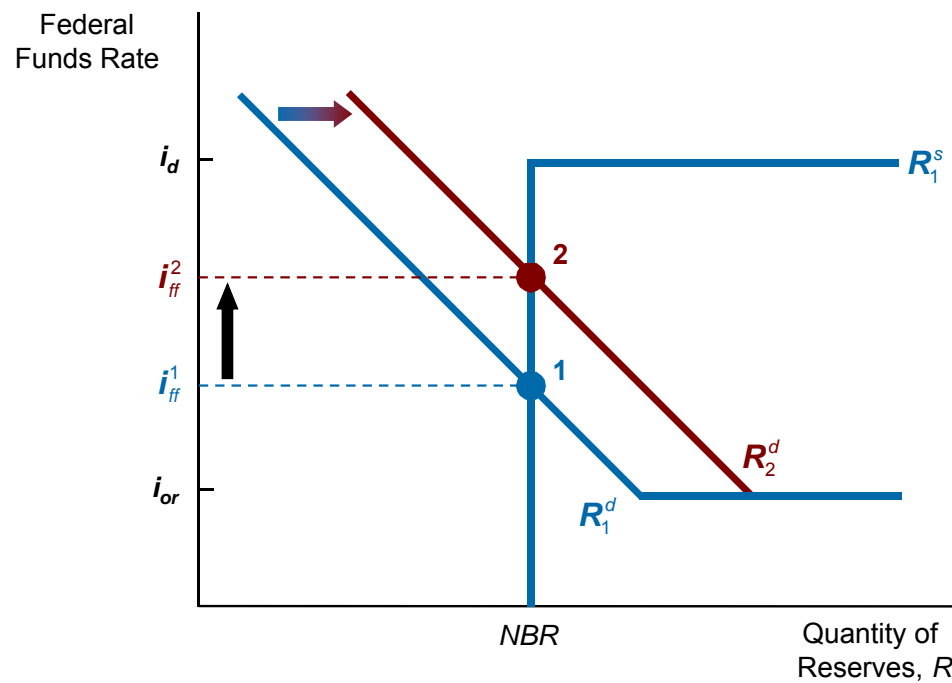


Step 1. Lowering the discount rate shifts the supply curve down...

Step 2. and lowers the federal funds rate.

(b) Some discount lending ($BR > 0$)

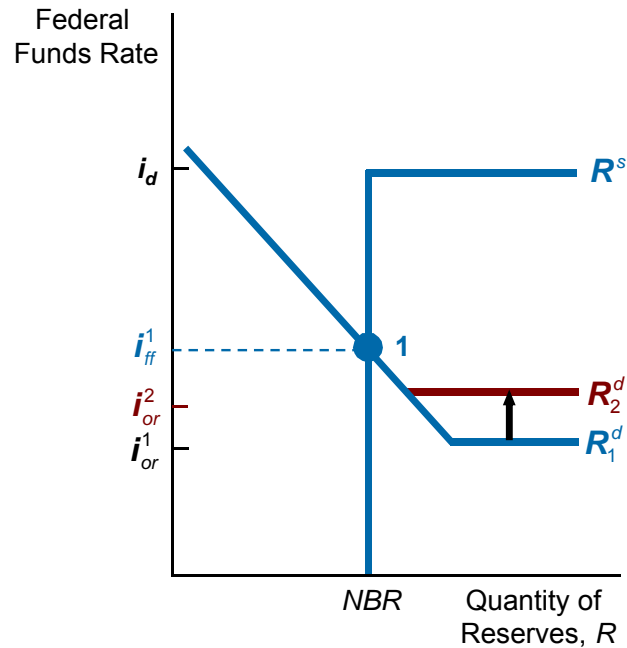
Figure 4 Response to a Change in Required Reserves



Step 1. Increasing the reserve requirement causes the demand curve to shift to the right . . .

Step 2. and the federal funds rate rises.

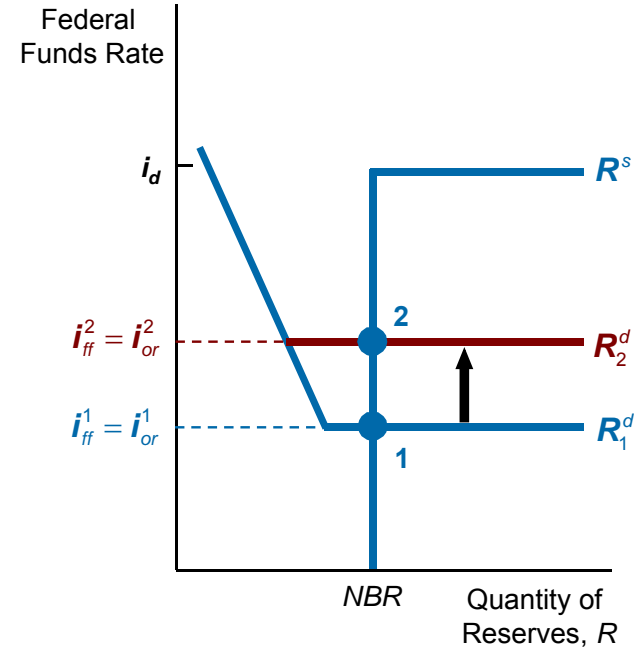
Figure 5 Response to a Change in the Interest Rate on Reserves



Step 1. A rise in the interest rate on reserves from i_{or}^1 to i_{or}^2 ...

Step 2. leaves the federal funds rate unchanged.

(a) initial $i_{ff}^1 > i_{or}^1$



Step 1. A rise in the interest rate on reserves from i_{or}^1 to i_{or}^2 ...

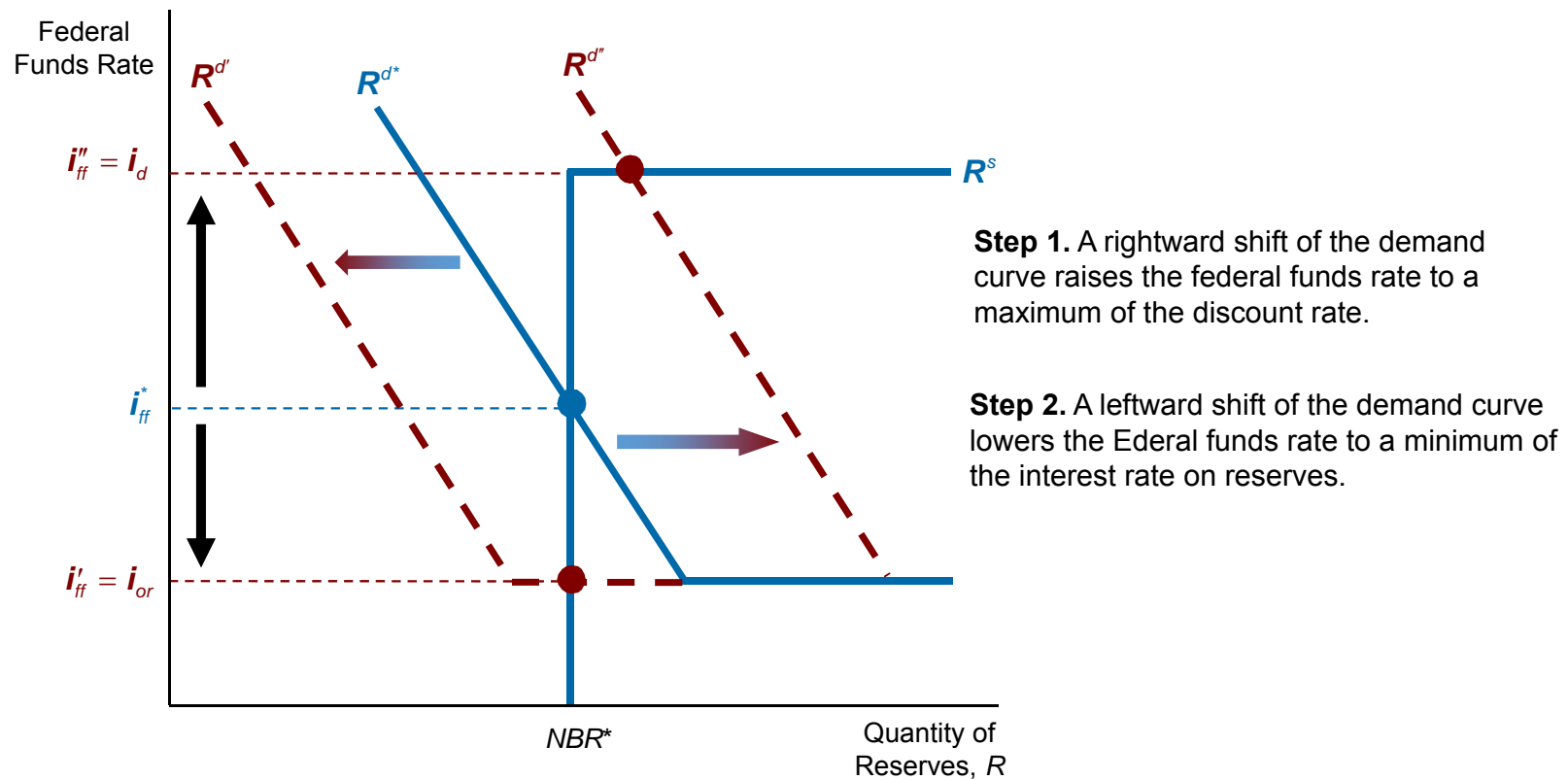
Step 2. raises the federal funds rate to $i_{ff}^2 = i_{or}^2$.

(b) initial $i_{ff}^1 = i_{or}^1$

Application: How the Federal Reserve's Operating Procedures Limit Fluctuations in the Federal Funds Rate

- Supply and demand analysis of the market for reserves illustrates how an important advantage of the Fed's current procedures for operating the discount window and paying interest on reserves is that they **limit fluctuations in the federal funds rate**.

Figure 6 How the Federal Reserve's Operating Procedures Limit Fluctuations in the Federal Funds Rate



Conventional Monetary Policy Tools

- During normal times, the Federal Reserve uses **three tools of monetary policy**—open market operations, discount lending, and reserve requirements—to control the money supply and interest rates, and these are referred to as **conventional monetary policy tools**.

Open Market Operations

- Dynamic open market operations
- Defensive open market operations
- Primary dealers
- TRAPS (Trading Room Automated Processing System)
- Repurchase agreements
- Matched sale-purchase agreements

Discount Policy and the Lender of Last Resort

- Discount window
- Primary credit: standing lending facility
 - Lombard facility
- Secondary credit
- Seasonal credit
- Lender of last resort to prevent financial panics
 - Creates moral hazard problem

Reserve Requirements

- Depository Institutions Deregulation and Monetary Control Act of 1980 sets the reserve requirement the same for all depository institutions.
- 3% of the first \$13.3 million of checkable deposits; 10% of checkable deposits over \$89.0 million
- The Fed can vary the 10% requirement between 8% to 14%.

Relative Advantages of the Different Monetary Policy Tools

- Open market operations are the dominant policy tool of the Fed since it has complete control over the volume of transactions, these operations are flexible and precise, easily reversed and can be quickly implemented.
- The discount rate is less well used since it is no longer binding for most banks, can cause liquidity problems, and increases uncertainty for banks. The discount window remains of tremendous value given its ability to allow the Fed to act as a lender of last resort.

On the Failure of Conventional Monetary Policy Tools in a Financial Panic

- When the economy experiences a full-scale financial crisis, conventional monetary policy tools cannot do the job, for two reasons.
- First, the financial system seizes up to such an extent that it becomes unable to allocate capital to productive uses, and so investment spending and the economy collapse.
- Second, the negative shock to the economy can lead to the zero-lower-bound problem.

Nonconventional Monetary Policy Tools During the Global Financial Crisis

- Liquidity provision: The Federal Reserve implemented unprecedented increases in its lending facilities to provide liquidity to the financial markets
 - Discount Window Expansion
 - Term Auction Facility
 - New Lending Programs

Nonconventional Monetary Policy Tools During the Global Financial Crisis

- Large-scale asset purchases: During the crisis the Fed started three new asset purchase programs to lower interest rates for particular types of credit:
 - Government Sponsored Entities Purchase Program
 - QE2
 - QE3

Figure 7 The Expansion of the Federal Balance Sheet, 2007-2014

