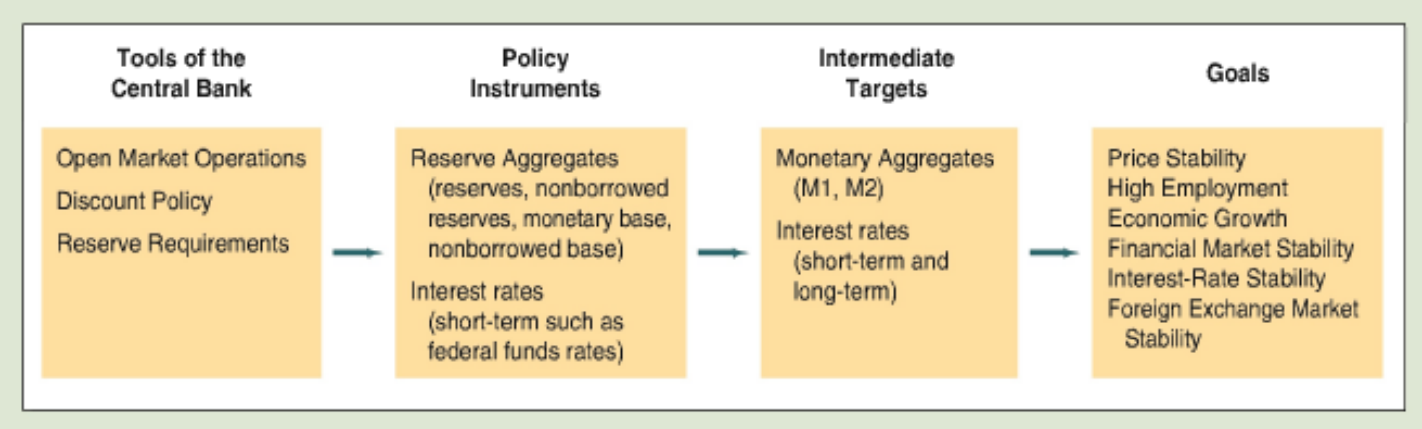
Tools of monetary policy

Lecture 5

Readings

- Mishkin, chapter 16, 10th edition (or chapter 15, 9th edition)

Tools, instruments, targets and goals of monetary policy



- Tools: actual tools of monetary policy
- Instruments: respond directly to policy tools, indicate monetary policy stance (tight or easy)
- Targets: closely linked to both instruments and goals, but not directly under CB control
- Goals: final objectives

Plan

- Understand Fed and ECB operating procedures: policy tools $\rightarrow$ policy instruments
- First Fed, then ECB
- Starting point:
  - Fed sets an interest rate target for conducting monetary policy
  - Target is a target for the federal funds rate (FFR), the rate charged on "overnight" loans between banks of deposits at the Fed, that is, overnight loans of reserves
  - FFR is the policy instrument
- Construct a model of demand and supply of reserves determining the FFR and use it to understand the effect of the tools of monetary policy on the FFR
- Move to the ECB; compare ECB tools to Fed ones

Fed tools and instruments of monetary policy

There are four policy tools that Fed can use to manipulate money supply and interest rates

1. Open market operations (or changes in nonborrowed reserves), which affect the monetary base
2. Discount loans (or changes in borrowed reserves), which affect the monetary base
3. Changes in reserve requirements, which affect the money multiplier
4. Interest paid on reserves, which affect the money multiplier

The Fed, as most other CBs, focus on a short term interest rate as the policy instrument

- Federal funds rate = interest rate on "overnight" loans of reserves from one bank to another
- Primary indicator of the stance of monetary policy

Federal funds (fed funds)

- Unsecured loans of reserves balances at the Fed that banks make to one another
- Enable banks with excess reserves to lend them to banks with reserves shortages
- Fed funds transaction redistribute bank reserves, does not raise/decrease total reserves
- Most common duration for fed funds loan "overnight", but also longer-term deals

Federal funds rate (fed funds rate)

- Rate at which fed funds transactions occur
- Fed sets a target level/range for the fed funds rate, which is the primary instrument of monetary policy
- Fed funds rate determined by market participants, not set by Fed; Fed "create conditions in reserve markets" to encourage fed funds to be traded at a certain level
- Open market operations change supply of reserve balances and create upward or downward pressure on market fed funds rate

Demand for reserves

- What happens to the total quantity of reserves demanded by banks, holding everything else constant, as the federal funds rate changes?

- Recall that total reserves can be split into two components:

  Total reserves (R) = Required reserves (RR) + Excess reserves (ER)

- Excess reserves

  - Benefit: ER provide insurance against deposit outflows

  - Cost: cost of ER is their opportunity cost, the interest rate that could have been earned on lending these reserves out to other banks, i.e., the FFR (i_{ff}), net of the interest rate earned on reserves (i_{or})

Demand of reserves, cont.

- When i_{ff} is above i_{or}
  - $i_{ff} \downarrow \Rightarrow$ opportunity cost of holding ER$\downarrow \Rightarrow$ demand for ER $\uparrow \Rightarrow$ holding everything else equal, including quantity of RR, the total quantity of reserves demanded R$\uparrow$
  - Above i_{or} the demand curve R^d is downward sloping
- When i_{ff} decreases to i_{or}
  - Banks will not lend in the overnight market at a lower interest rate than the rate paid on reserves
  - Banks are willing to hold any amount of excess reserves at i_{or}
  - At i_{or} the demand curve R^d becomes horizontal

Supply of reserves

- Reserves are supplied by the CB
- Recall that the supply of total reserves can be split into two components:

  Total reserves (R) = Nonborrowed reserves (NBR) + Borrowed reserves (BR)

  1. Nonborrowed reserves: supplied by Fed through open market operations
  2. Borrowed reserves: supplied by the Fed thorough discount loans

- Borrowed reserves:
  - Cost of borrowing from the Fed is the cost to obtain a discount loan: the discount rate i_d
  - Borrowing from Fed at discount window is substitute for borrowing from other banks
  - As long as i_d is above the FFR, banks will not borrow from the Fed

Supply of reserves, cont.

- When i_{ff} is below i_d
  - Banks will not borrow from the Fed $\Rightarrow$ BR= 0
  - Supply of reserves fixed at quantity of NBR supplied by the Fed
  - Below i_d the supply curve R^s is vertical and R^s = NBR
- When i_{ff} rises to i_d
  - Banks will become willing to borrow at i_d
  - Fed stands willing to make as many discount loans as banks want at i_d
  - At i_d the supply curve R^s becomes horizontal

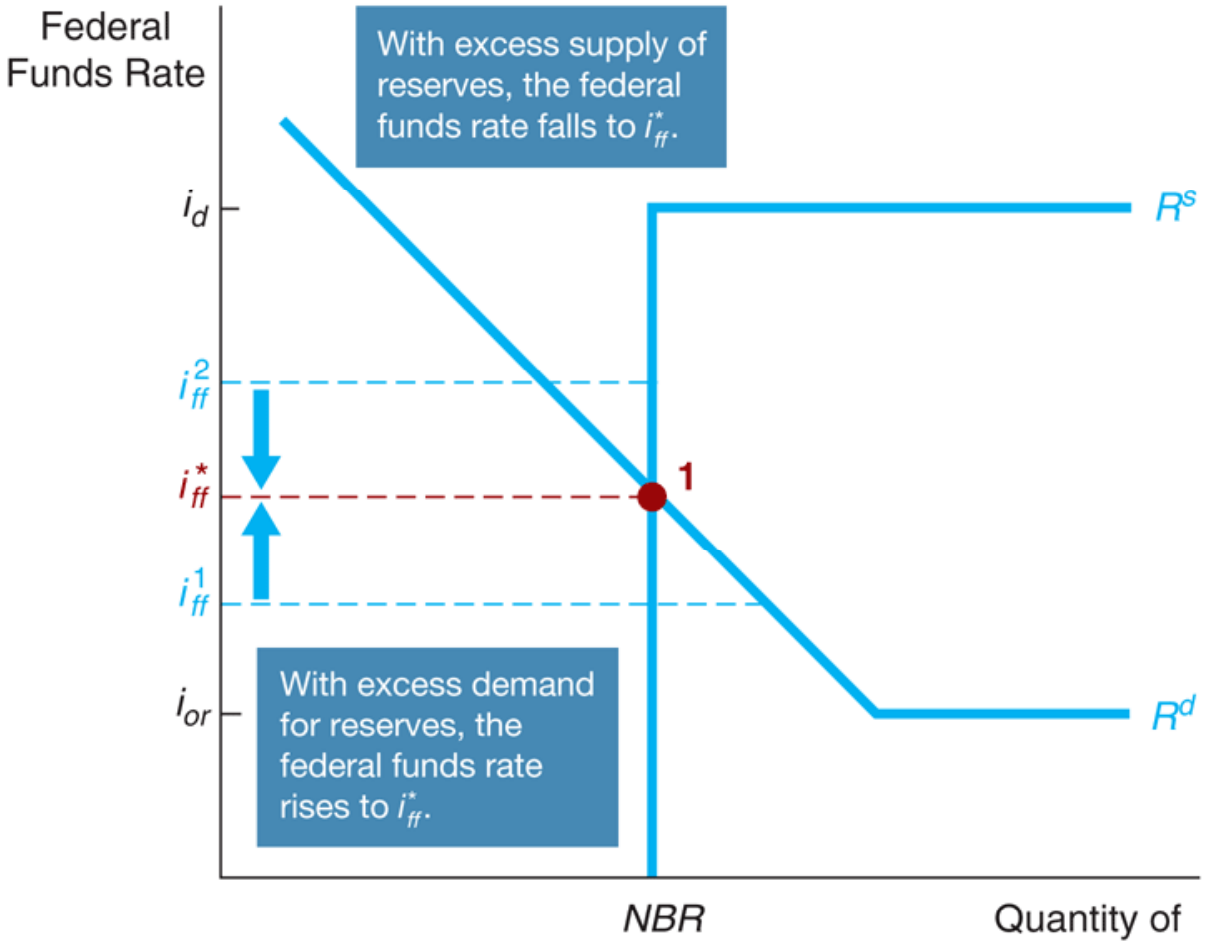
Supply of reserves, cont.

In practice, the Fed:

1. Sets a target i_{ff}^* for the federal funds rate
2. Determines the amount of nonborrowed reserves NBR it must supply to make the equilibrium federal funds rate equal to i_{ff}^*
3. Sets the discount rate i_d above its target for the federal funds rate
4. Stands willing to make discount loans to banks at the discount rate i_d

These operating procedures give the supply curve for reserves the unusual shape just described

Equilibrium in the market for reserves



Aside

- Why no role in model for other assets banks hold as substitute for reserves (say, loans or government securities) and interests paid on those assets?

- There is such a role, but kept in the back. Let's see

- Suppose each bank allocates a portfolio A across 3 liquid assets: reserves held at the Fed (R, i_{or}); reserves lent (or borrowed) on the federal funds market (F, i_{ff}); government securites (B, i_b)

- Demands for 3 assets (for simplicity set $i_{or}=0$):
  - $R^d=R^d(A, i_{ff}, i_b)$
  - $F^d=F^d(A, i_{ff}, i_b)$
  - $B^d=A-R^d-F^d$

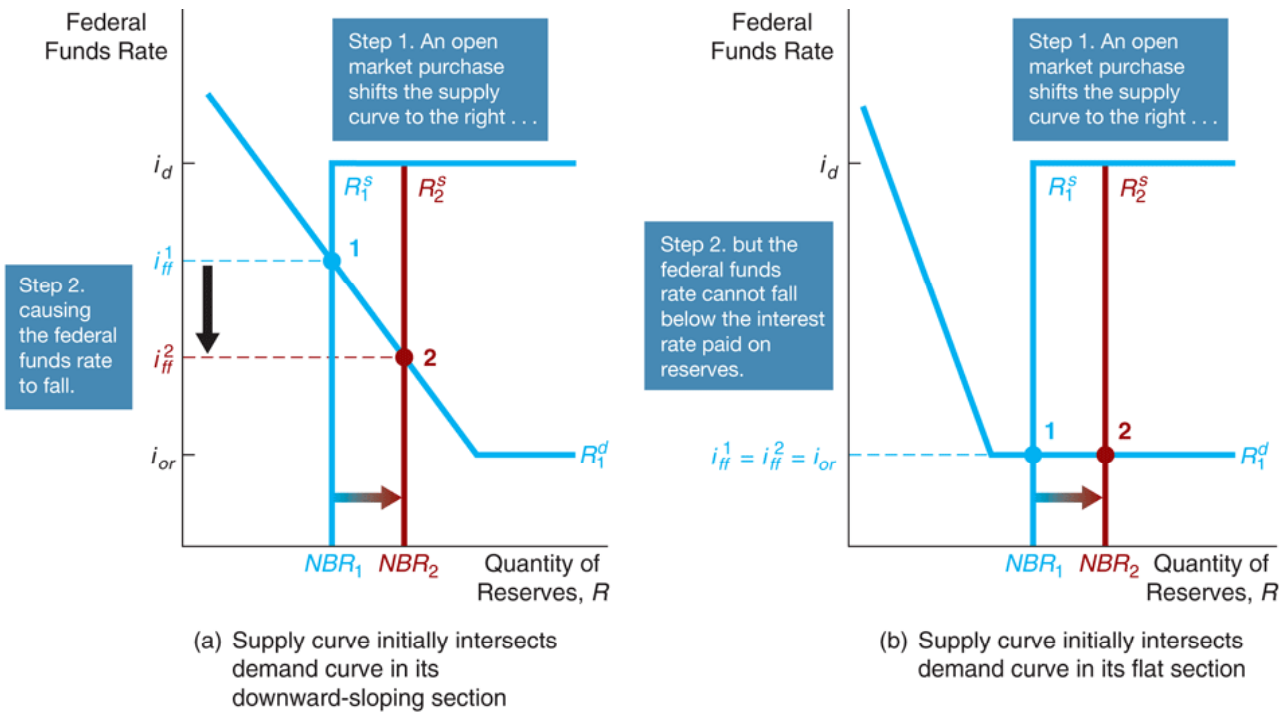
- Fixed supply of reserves R set by Fed; 0 net supply of federal funds; in equilibrium
  - $R^d(A, i_{ff}, i_b)=R$
  - $F^d(A, i_{ff}, i_b)=0$

- Use the second to get i_b as a function of i_{ff}; substitute in R^d to get a demand for reserves negatively related only to i_{ff}: $R^d=R^d(A, i_{ff})$

Market equilibrium

- Equilibrium occurs at the intersection between demand and supply
  - If FFR above i_{ff}^* $\Rightarrow$ excess supply $\Rightarrow$ FFR decreases
  - If FFR below i_{ff}^* $\Rightarrow$ excess demand $\Rightarrow$ FFR increases
- Under normal conditions
  - The equilibrium federal funds rate equals the Fed's target i_{ff}^*
  - The discount rate i_d is above the equilibrium fed funds rate
    The equilibrium level of reserves equals NBR
    The Fed does not make any discount loans
  - The interest on reserves i_{or} is below the fed funds rate

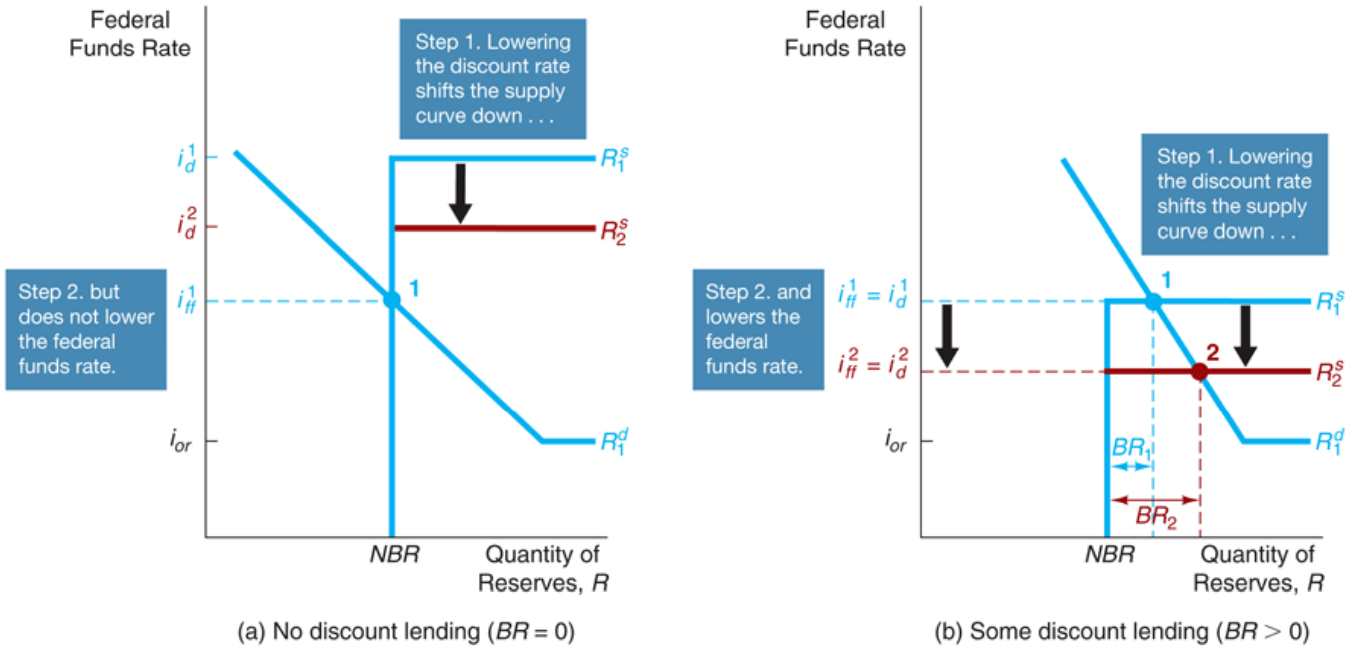
Effect of open market operations on FFR



- If the intersection of supply and demand occurs on the downward-sloped section of the demand curve, an open market purchase causes the FFR to fall; an open market sale causes the FFR to rise (typical situation)

- If the intersection of supply and demand occurs on the horizontal section of the demand curve, an open market purchase has no effect on the FFR

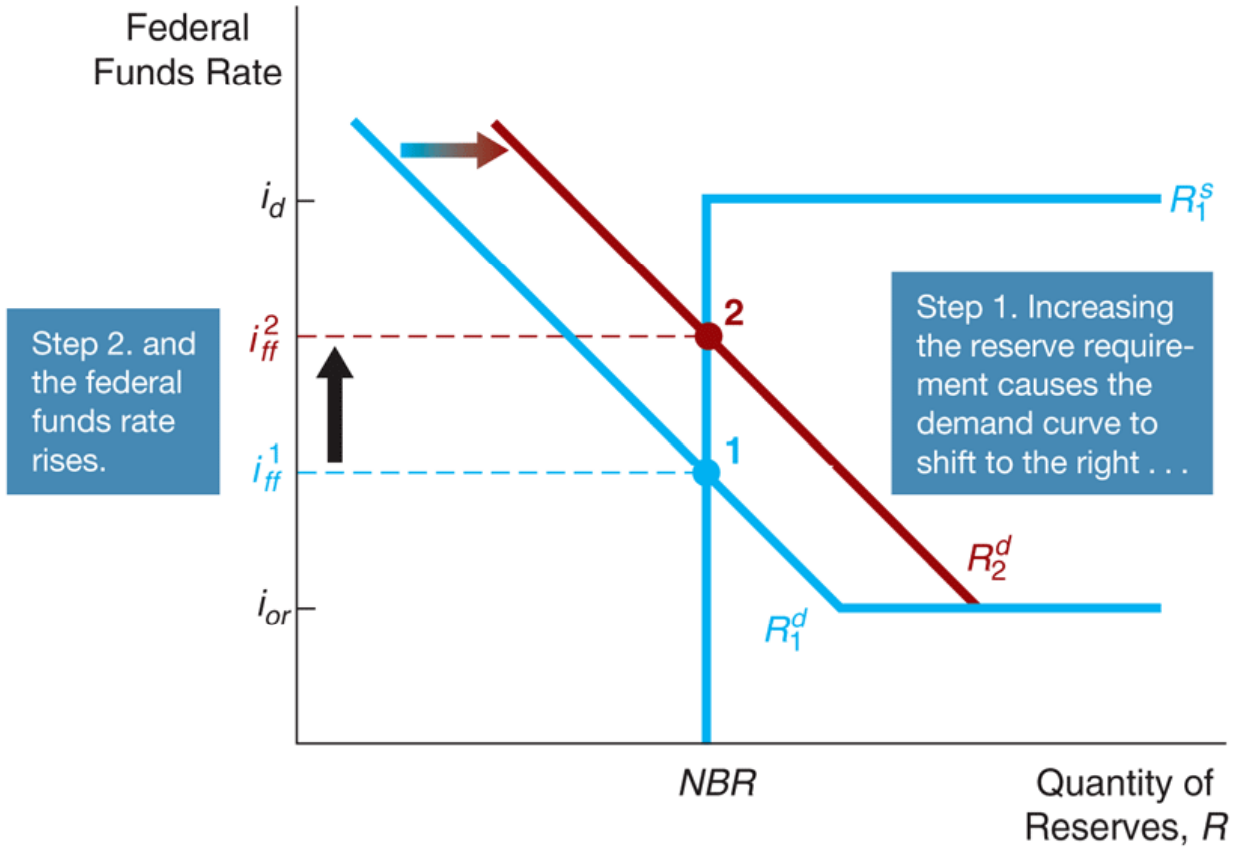
Effect of changes in the discount rate on FFR



- If the intersection of supply and demand occurs on the vertical section of the supply curve, a change in the discount rate will not affect the fed funds rate (typical situation)

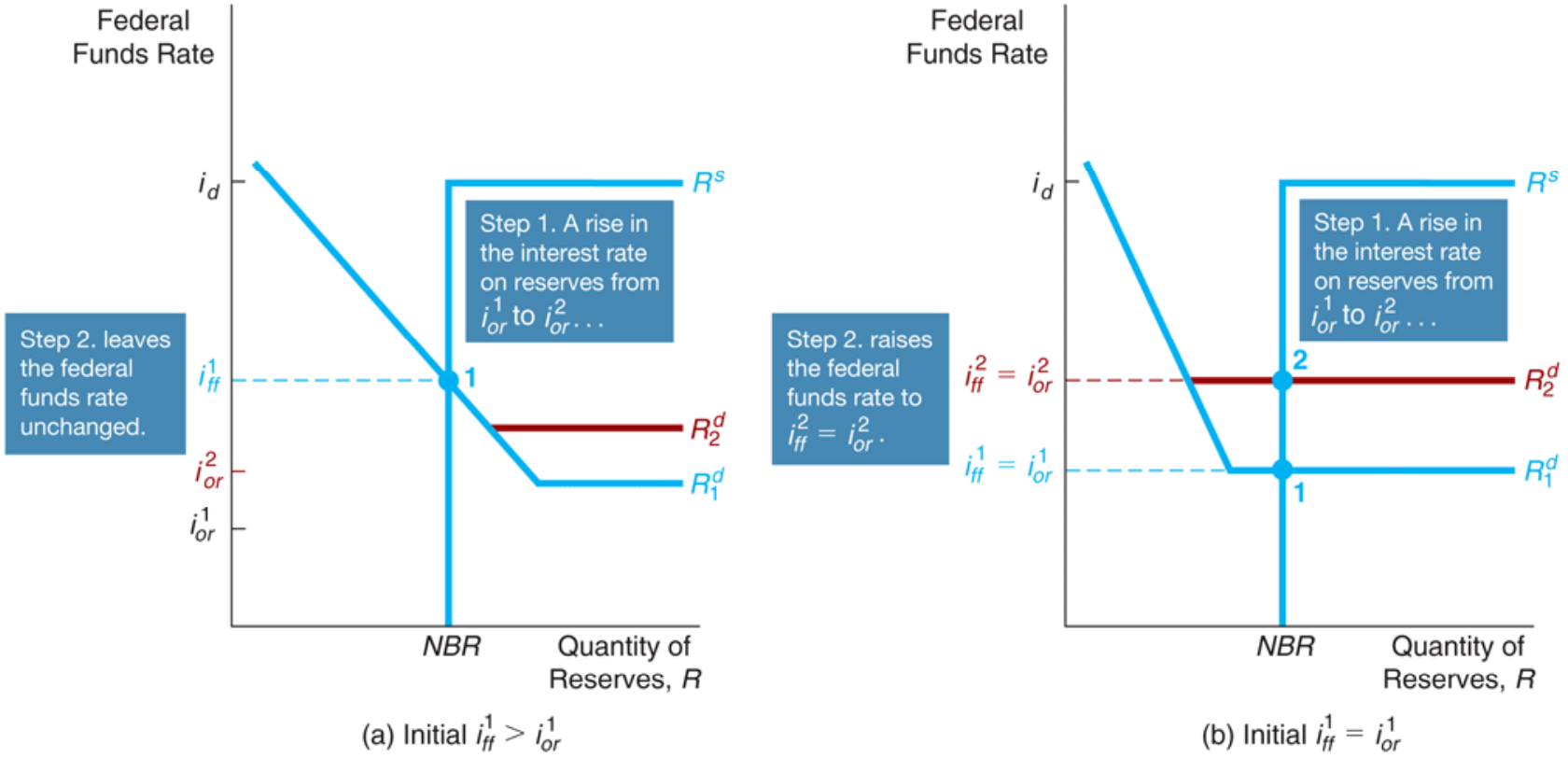
- If the intersection of supply and demand occurs on the horizontal section of the supply curve, a reduction in the discount rate shifts that portion of the supply curve down and the federal funds rate fall

Effect of changes in required reserves on FFR



- When the Fed raises reserve requirement, the federal funds rate rises and when the Fed decreases reserve requirement, the federal funds rate falls (shifting the demand curve)

Effect of changes in interest on reserves on FFR



Why interest on required and excess reserves?

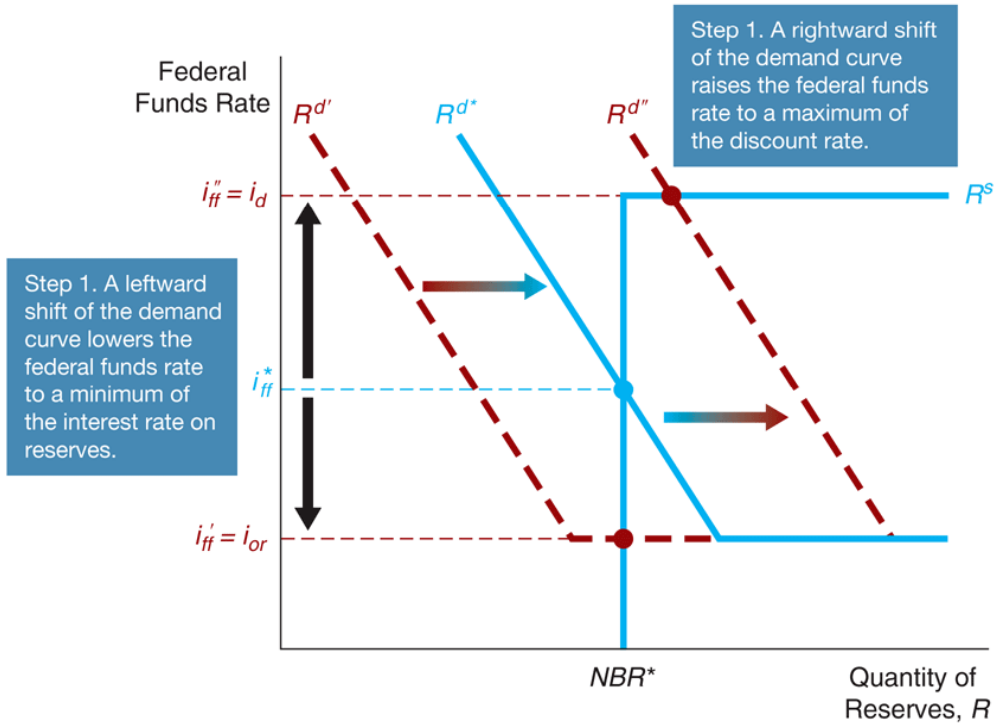
- Federal Reserve pays interest on required reserve balances - balances held at Fed to satisfy reserve requirements - and on excess balances - balances held in excess of required reserve balances, starting October 2008

- Interest rate paid on required reserve balances is determined by the Board and is intended to eliminate effectively the implicit tax that reserve requirements used to impose on banks and thus promoting efficiency

- Interest rate paid on excess balances is also determined by the Board and gives the Fed an additional tool for the conduct of monetary policy; specifically, paying interest rate on excess reserves puts a floor under the federal funds rate

- Allow for quantitative easing during the subprime financial crises of 2007-2009

How the Fed operating procedures limit fluctuations in the fed funds rate



- Large unexpected increases in demand for reserves do not cause increases of i_{ff} above i_d as borrowed reserves (discount loans) just continue to raise to match the larger demand

- Large unexpected decreases in demand for reserves do not cause decreases of i_{ff} below i_{er} as excess reserves just continue to raise so that the quantity demanded of reserves equals the quantity of nonborrowed reserves supplied

Further questions

- How does the Fed uses the three tools in practice?
- Which of the three tools is more effective?

Open market operations in practice

- Primary tool used by the Fed to control money supply and interest rates
- Open market purchases (sales) expand (shrink) reserves and monetary base, thereby increasing (decreasing) money supply and lowering (raising) short-term interest rates
- Fed conducts open market operations by buying and selling US government securities, especially US Treasury bills
- Since the market for US Treasury bills is very active (most liquid market with largest trading volume), the Fed can make large purchase and sales without disrupting the market

Open market operations in practice

- Although the Federal Open Market Committee (FOMC) makes decisions on open market operations (that is, sets a target for the FFR), the trades themselves are conducted at the trading desk at the Federal Reserve Bank of New York
- Open market operations are conducted daily
- Each day, the staff at the trading desk:
    1. Contacts the primary dealers in the market for Treasury securities
    2. Collects information about whether a change in reserves is needed to achieve the target FFR
    3. Formulates a plan for the day in terms of open market operations to be conducted
    4. Execute the plan through the TRAPS (Trading Room Automated Processing System)

Primary dealers list

Primary dealers serve as trading counterparties of the New York Fed in its implementation of monetary policy. This role includes the obligations to: (i) participate consistently in open market operations to carry out U.S. monetary policy pursuant to the direction of the Federal Open Market Committee (FOMC); and (ii) provide the New York Fed's trading desk with market information and analysis helpful in the formulation and implementation of monetary policy. Primary dealers are also required to participate in all auctions of U.S. government debt and to make reasonable markets for the New York Fed when it transacts on behalf of its foreign official account-holders.

BNP Paribas Securities Corp.	MF Global Inc.
Barclays Capital Inc.	Merrill Lynch, Pierce, Fenner & Smith Incorporated
Cantor Fitzgerald & Co.	Mizuho Securities USA Inc.
Citigroup Global Markets Inc.	Morgan Stanley & Co. LLC
Credit Suisse Securities (USA) LLC	Nomura Securities International, Inc.
Daiwa Capital Markets America Inc.	RBC Capital Markets, LLC
Deutsche Bank Securities Inc.	RBS Securities Inc.
Goldman, Sachs & Co.	SG Americas Securities, LLC
HSBC Securities (USA) Inc.	UBS Securities LLC.
Jefferies & Company, Inc.	
J.P. Morgan Securities LLC	

Open market operations in practice, cont.

- Most of the time, the Fed changes the monetary base only temporarily using
  - Repurchase agreements (repo)

    The Fed purchases US government securities with an agreement that the seller will buy them back at a specified price on a specified date, usually within two weeks → temporary open market purchase
  - Matched sale-purchase agreements (reverse repo)

    The Fed sells US government securities with an agreement that the buyer will sell them back at a specified price on a specified date, again usually within two weeks → temporary open market sale

- At times, the Fed may see the need to address a persistent reserve shortage or surplus and thus conduct open market operations which are not self-reversing and have permanent effects on the monetary base (called outright purchases or sales)

Advantages of open market operations

1. Open market operations occur at the initiative of the Fed, which has complete control over their volume

2. Open market operations are flexible and precise (can be large or small and can achieve any change in reserves)

3. Open market operations are easily reversed

4. Open market operations can be implemented quickly

Discount policy in practice

- When a bank receives a discount loan from the Fed, it is said to have received a loan at the "discount window"

- Three types of discount loans:

  1. Primary credit or standing lending facility:

     Backup source of liquidity for healthy banks, which are allowed to borrow all they want overnight at i_d (usually 100 basis points above the target FFR, now 0.75 percent)

     Put a ceiling on the market FFR of i_d; in this way the market FFR never raises too far above the target FFR

  2. Secondary credit: given to banks that are in financial trouble (interest rate usually 50 basis points above the discount rate)

  3. Seasonal credit: given to meet needs of a limited number of banks in vacation and agricultural areas that have a seasonal pattern of deposits

Discount policy and lender of last resort

- Lender of last resort provides reserves to banks when no one else would

- Discount lending is most important to prevent spreading of bank and financial panics

- Examples: In the Black Monday Stock Market Crash of October 1987, in September 2001 and in the current financial crises, the Fed made clear that it would supply additional reserves to the financial system, as necessary, through the discount window; failure to use discount tool during the Great Depression

- Problem: creates moral hazard problem

  Banks take on more risk (especially the "too big to fail") expecting that they will always receive Fed loans when they are in troubles because their failure would be likely to precipitate a bank or financial panic

  Moral hazard in financial markets: under asymmetric information, risk (*hazard*) that the borrower engages in activities that are undesirable (*immoral*) from the lender's point of view, because they make it less likely that the loan will be repaid

Advantages and disadvantages of discount policy

- Advantage:

  It allows the Fed to act as a lender of lender of last resort during financial panics

- Disadvantages as a tool for monetary policy:
  - Cannot be controlled by the Fed; the decision maker is the bank
  - Neither quickly made, nor easily reversed (first proposed by the Federal Reserves banks, then approved by the Board of Governors)

- Use:
  - Discount facility not used to conduct monetary policy
  - Discount facility used as a backup facility to prevent the federal funds rate from rising too far above the target

Reserves requirements in practice

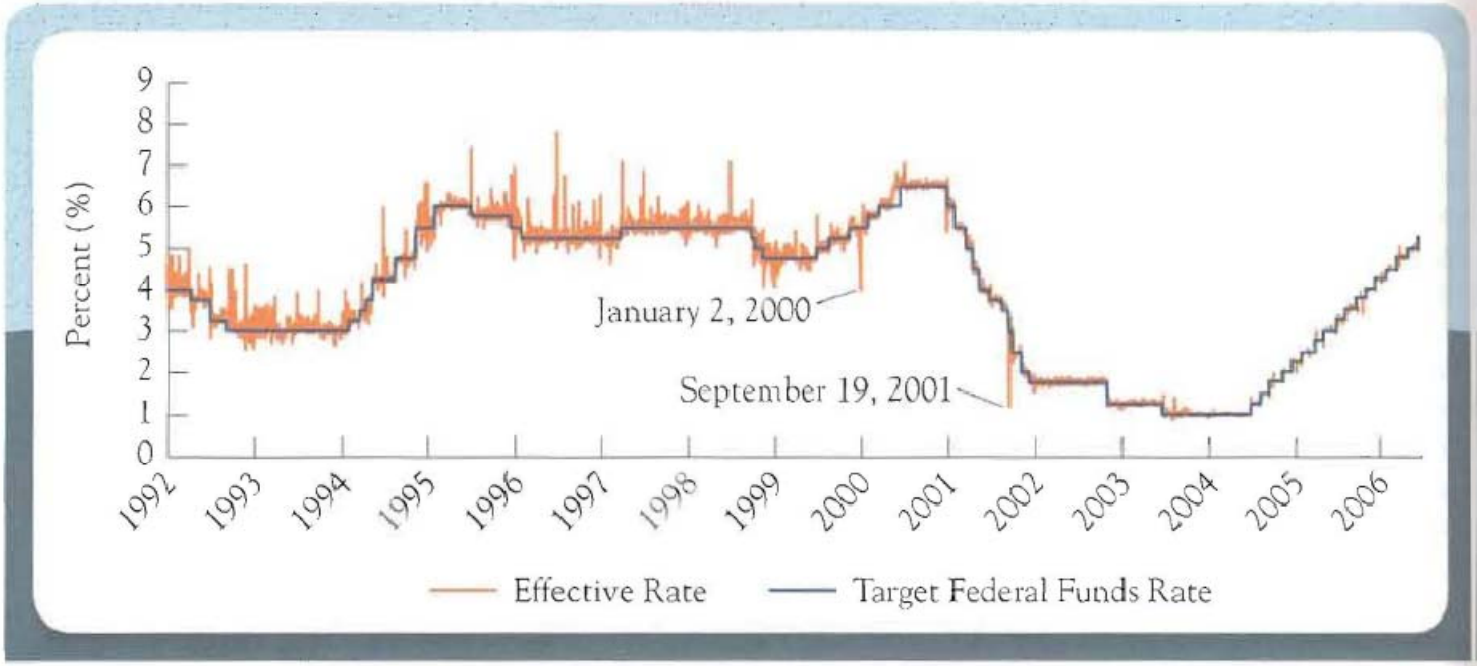
- Depository Institutions Deregulation and Monetary Control Act of 1980 sets the reserve requirement the same for all depository institutions
- The Fed can vary the 10% requirement between 8% to 14%, 0% after 2020
- Disadvantages as a tool for monetary policy
  - No longer binding for most banks
  - Can cause immediate liquidity problems for banks with binding reserve requirements
  - Continually changing reserve requirements would create uncertainty for banks making liquidity management difficult
  - Many economists advocate elimination of reserve requirements (as in Canada, Australia and New Zealand)

Interest on reserves in practice

- Fed started paying interest on reserves only in 2008: short history
- Fed has set it below the FFR; only used to set a floor under the FFR
- Played key role when Fed exited the zero-target policy for FFR and raises it
  - Since banks accumulated large amounts of excess reserves, raising FFR would require massive open market operations
  - Raising interest on reserves can help raising the FFR

Target and market federal funds rate

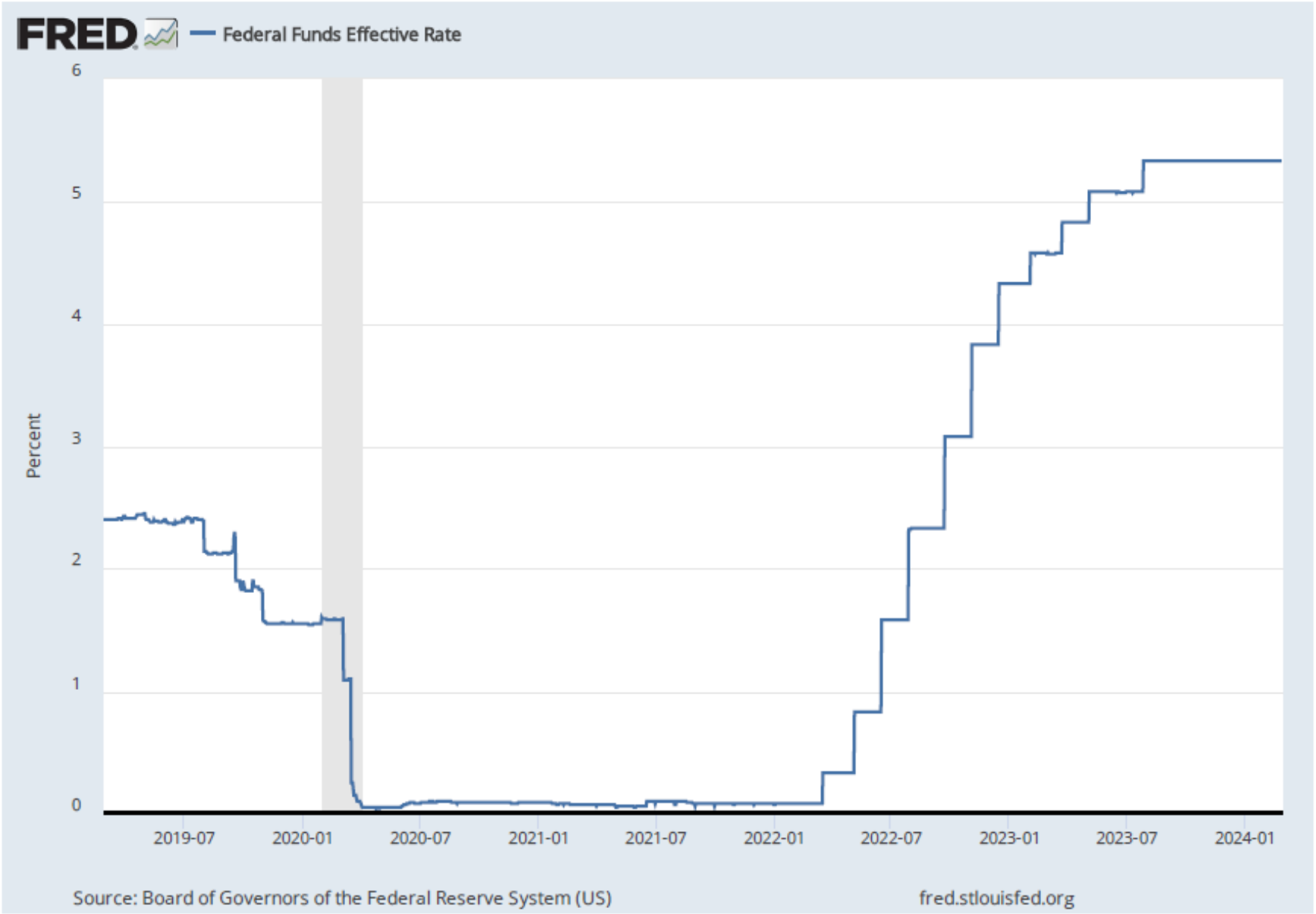
Figure 18.3 Target Federal Funds Rate and Daily Market Rate, January 1992–July 2006



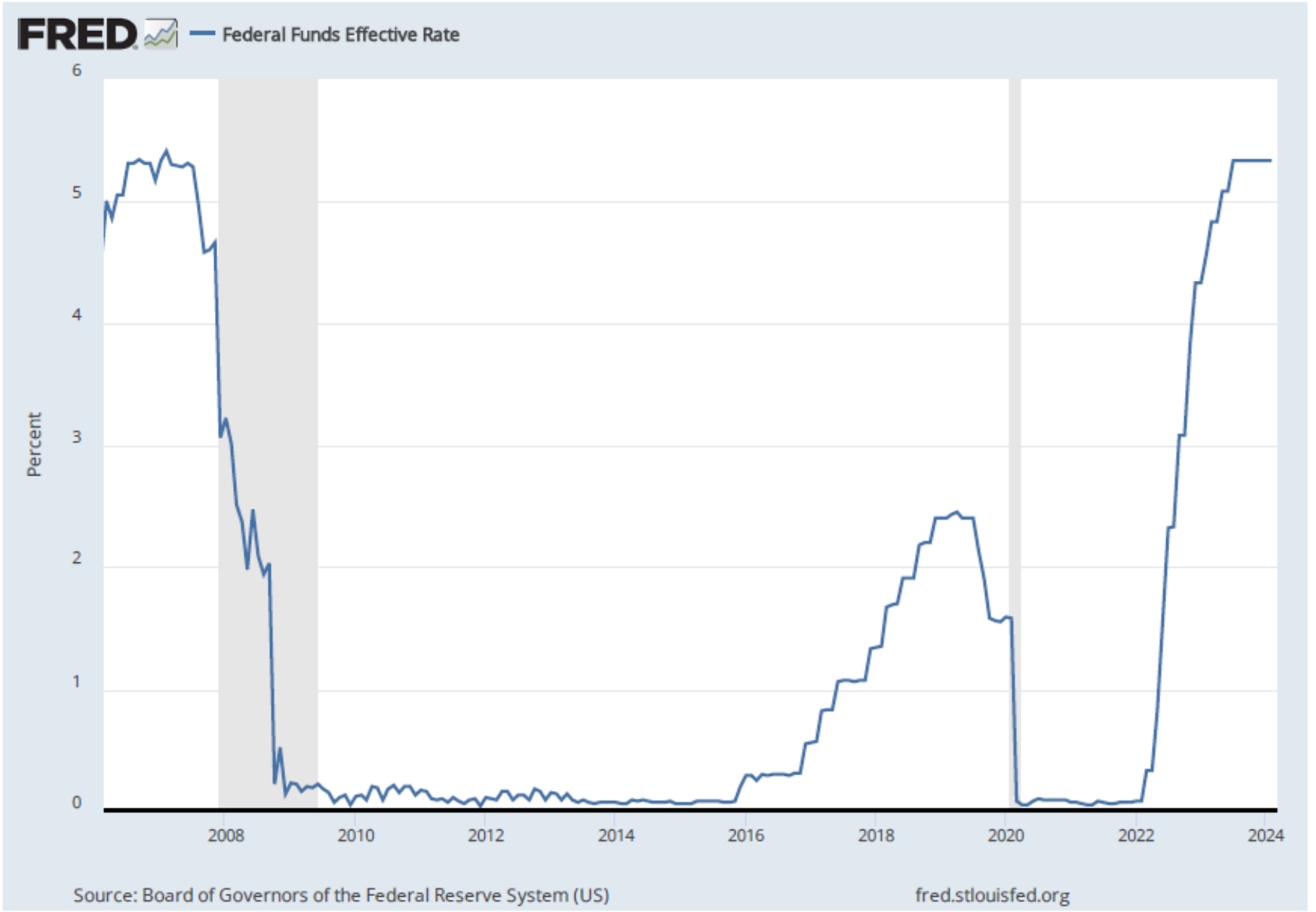
SOURCE: *Board of Governors of the Federal Reserve*

Market rate close to target rate on most days. However, occasionally large deviations. Recent changes in Fed procedures together with improvements in information systems both within banks and at the Fed seem to have stabilized market rates.

Federal funds effective rate



Federal funds effective rate



Tools of monetary policy at the ECB

ECB main monetary policy tools are:

1. Open market operations

2. Standing facilities → channel/corridor system (also in Australia, Canada, New Zealand)

3. Reserve requirements

Policy instrument:

1. Set a target financing rate to signal stance of monetary policy (minimum bid rate on main refinancing operations)

2. This in turn sets a target for overnight rates (interest rates for very short-term interbank loans, such as EONIA)

Open market operations at the ECB

- Most important monetary policy tool
- Executed on the initiative of the central bank
- Three types:

1. Main refinancing operations (conducted on a weekly basis; only temporary – one or two weeks maturity)
2. Longer term refinancing operations (conducted on a monthly basis; only temporary - three months maturity)
3. Fine-tuning and structural operations (on an *ad hoc* basis; frequency and maturity not standardized; both temporary and permanent)

Open market operations at the Fed and the ECB

- ECB refinancing operations broadly similar to the Fed daily open market operations
- But some differences:

1. Refinancing operations conducted at the national central banks (NCBs) simultaneously; in the US everything is done at the NYFed
2. Fed solicits prices from a short list of 20 primary securities dealers; hundreds of European banks participate in the ECB weekly auctions
3. Under normal circumstances, Fed takes US government securities; in contrast, because of the heterogeneity in financial structure in different countries, the NCBs accepts a broader range of securities including not only government-issued bonds but also privately issued bonds and bank loans

$\Rightarrow$ More complex structure of open market operations in Euro area

Standing facilities and channel/corridor system at the ECB

- ECB offers two standing facilities:

  1. Marginal lending facility: ECB stands ready to loan overnight any amount banks ask for at a fixed interest rate (marginal lending rate)

  2. Deposit facility: ECB stands ready to pay banks a fixed interest rate (deposit rate) on overnight deposits they would like to keep at the central bank

- The ECB marginal lending facility is the analog of the Fed primary credit facility

- Both facilities have overnight maturity and are available on banks own initiative

- Since there are no limits on the access to these facilities, their interest rates provide a ceiling and a floor to the overnight interest rate in the market for reserves

- The marginal lending rate is normally substantially higher than the market rate and the target rate and the deposit rate substantially lower $\Rightarrow$ Banks use the standing facilities when there are no other alternatives

- Spread between marginal lending and deposit rate used to be 200 basis points and has recently been reduced to 75 basis points

Minimum reserve system at the ECB

The ECB imposes reserve requirements

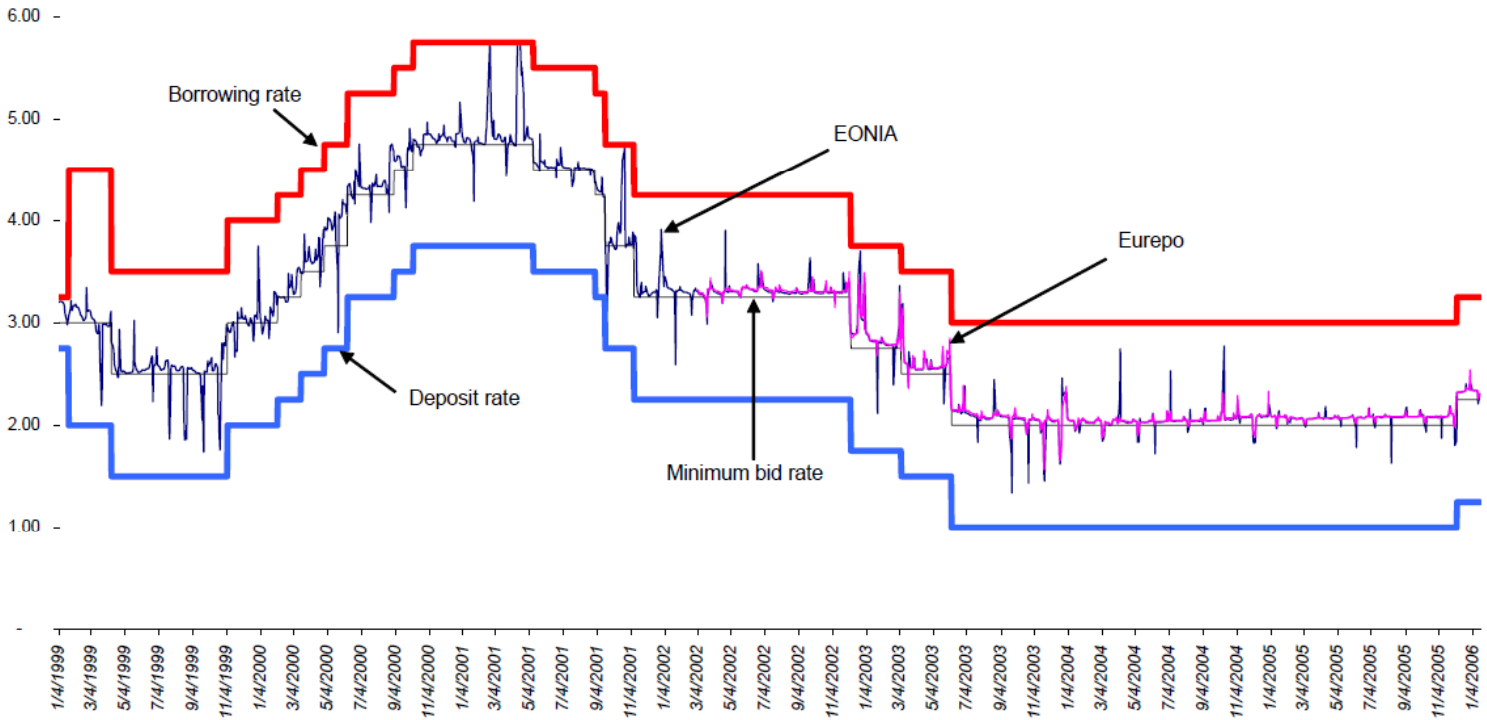
1. 1% of the total checking deposits and other short-term deposits, used to be 2%
2. Used to pay interest close to market rate on required reserves, since 2023 at 0%

Euro area overnight rates and ECB rates

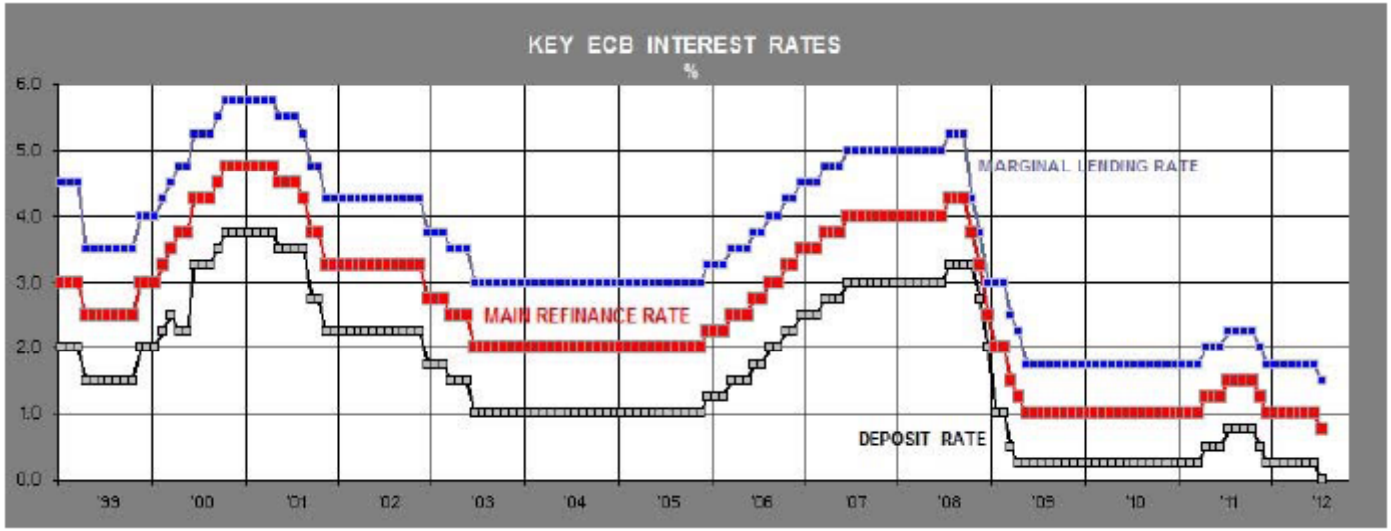
Figure 1: Interest rate channel of the European Central Bank.

EONIA (Euro Overnight Index Average) and Eurepo (reference rate for the GC repo market)

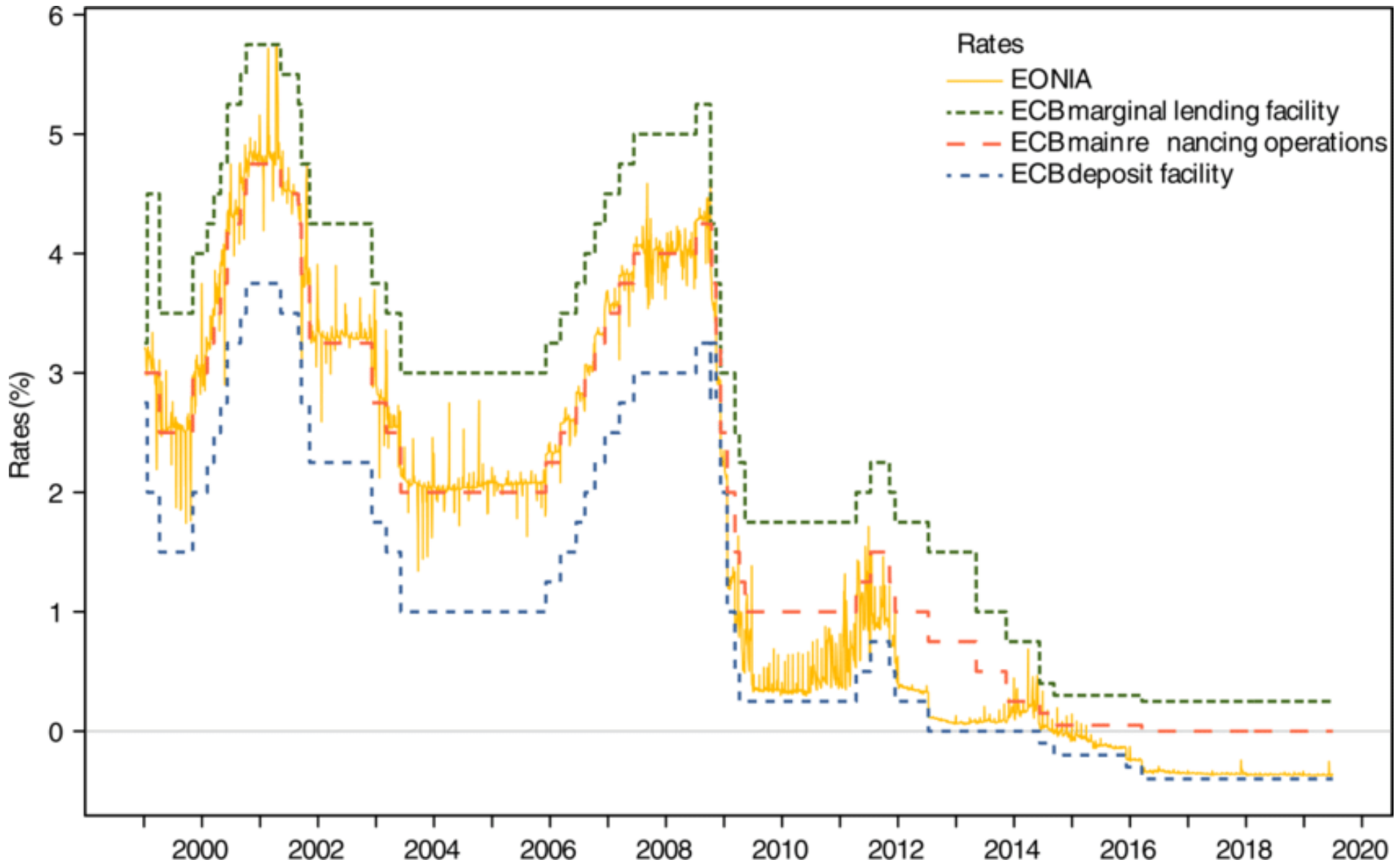
Source: European Banking Federation and ECB



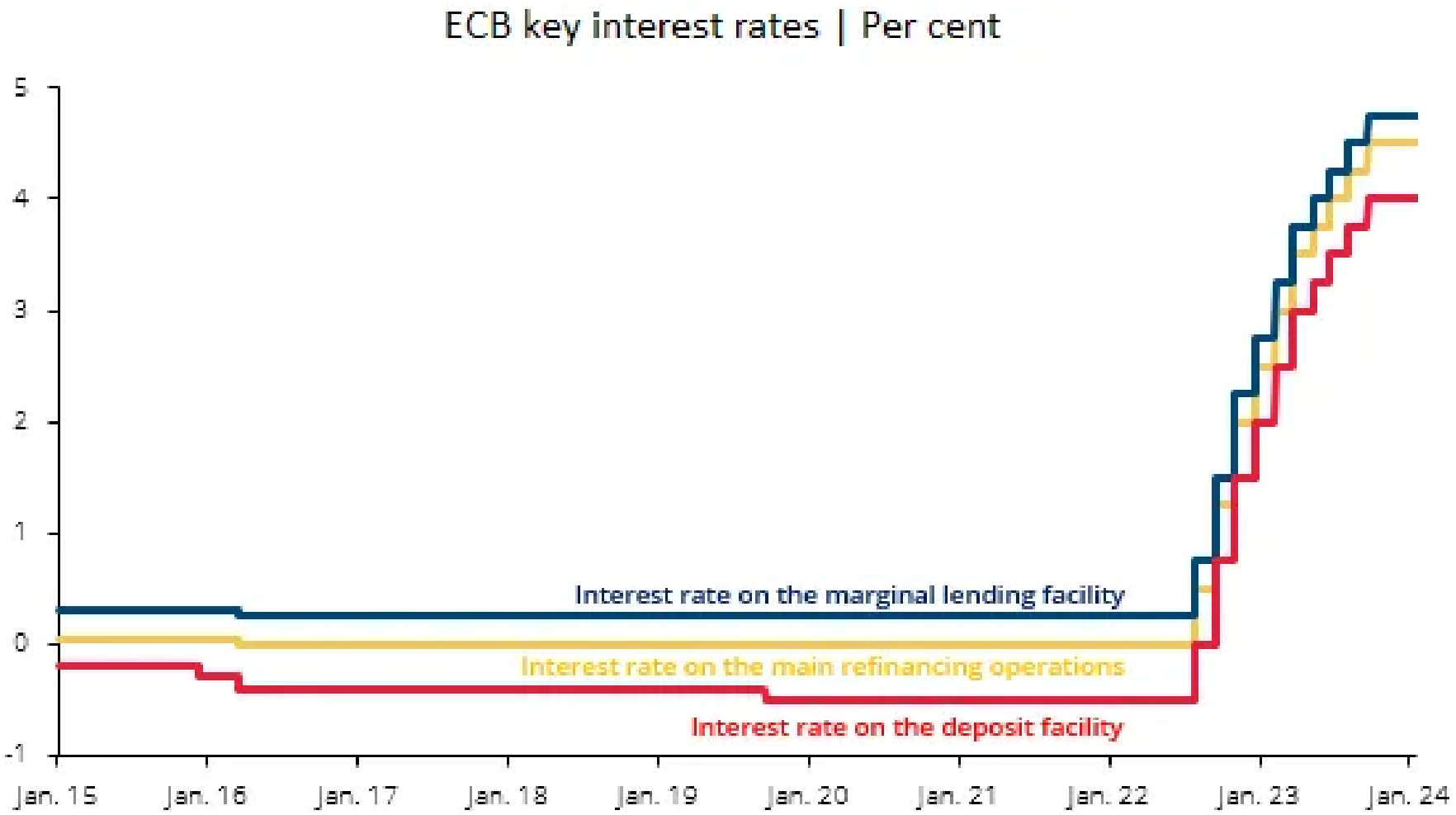
Euro area ECB rates



Euro rates


Rates
EONIA
ECB marginal lending facility
ECB mainre nancing operations
ECB deposit facility
Rates (%)
6
5
4
3
2
1
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020

ECB rates


ECB key interest rates | Per cent
5
4
3
2
1
0
-1
Interest rate on the marginal lending facility
Interest rate on the main refinancing operations
Interest rate on the deposit facility
Jan. 15
Jan. 16
Jan. 17
Jan. 18
Jan. 19
Jan. 20
Jan. 21
Jan. 22
Jan. 23
Jan. 24