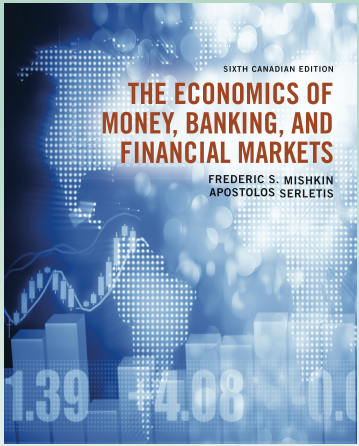
Mishkin/Serletis

The Economics of Money, Banking, and Financial Markets

Sixth Canadian Edition



Chapter 16

Tools of Monetary Policy

Learning Objectives

1. Characterize the framework for the implementation of monetary policy in Canada
2. Explain the market for reserves and how changes in monetary policy affect overnight interest rates
3. Summarize how conventional monetary policy tools are implemented and the strength and weaknesses of each tool
4. Explain unconventional monetary policy tools
5. Compare and contrast the policy tools of the Bank of Canada with those of the Federal Reserve and ECB

The Large Value Transfer System (LVTS)

- The **Large Value Transfer System** (LVTS)
  - *Electronic, real-time net settlement network*
  - *Designed to provide immediate finality and settlement to time-critical transactions*
- The **LVTS participants** know in real time their large-value, wholesale transactions (over $50,000)
- Transactions account for < 1% of the total number of transactions but 94% of the value
- The LVTS uses **multilateral netting**
  - *Only the net credit or debit position of each participant vis-à-vis all other participants is calculated for settlement*

Systemic Risk and the LVTS

- The risk to the entire payments system due to the inability of one financial institution to fulfill its payment obligations
- The LVTS helps eliminate **systemic risk**

- Participants can make a payment only if:
  - *they have positive settlement balances in their accounts with the Bank of Canada,*
  - *posted collateral (such as T-bills and bonds), or*
  - *explicit lines of credit with other LVTS participants*

LVTS:

- Operated by the CPA (since 1999).
- 15 LVTS participants + BoC members of the CPA.
- The system allows participant to send large payments securely, in real time, with certainty that the payment will be settled.
- All other CPA members can arrange LVTS payments through LVTS participants.
- Settlement payments with the BoC take place at the end of business day.

Multilateral-netting - an agreement among the participants that transactions be summed rather than settled individually.

- Benefits of reducing the need for a large amount of settlement balances.

Systemic Risk - the risk of collapse of the entire system

The BoC guarantees settlement of the SVS in the extremely unlikely circumstance of more than one participants defaulting on the same day.

Non-LVTS (ACSS) Transactions

These are non-LVTS (paper-based) payment items, such as cheques

These items are cleared through the Automated Clearing Settlement System (ACSS), an electronic payments system also operated by the CPA

The ACSS aggregates interbank payments and calculates the net amounts to be transferred from and to each participant's settlement account with the Bank of Canada

The **Direct Clearers** are subset of LVTS participants who participate directly in the ACSS

Non-LVTS Transactions.

- Settlement of small paper-based transactions. (eg cheques) and small-value electronic transactions (eg debit card transaction)

Direct clearers - a CPA member who maintains a settlement account at BoC.

- All other are indirect clearers
- They have a direct clearer acting as its agent in the ACSS clearing and settlement process.

The Bank of Canada's Policy Rate

- **Overnight interest rate** (i_{or})
  - *The interest rate at which participants borrow and lend overnight funds to each other in the money market*
- **The reference rate**
  - *The Bank of Canada signals its monetary policy stance by announcing a target for the overnight interest rate*
- **The policy rate**
  - *The target for the overnight rate which is the main tool the Bank uses to conduct monetary policy*

Overnight interest rate = Reference rate.
Target for the ONR = Policy Rate

- The operating band is ½% wide.
- BoC announces the target for the overnight interest rate. (policy rate)
- the target is the midpoint of the operating band.
- Midpoint + ¼% = bank rate (i_b), the upper bound of the operating band.
- Midpoint − ¼% = settlement balances rate (ier) the lower bound of the operating band.

Bank rate - the rate at which the BoC lends to FIs.
Settlement balance rate - the rate paid by the BoC to FIs with a positive settlement balance.

The Operating Band for the Overnight Rate

- The Bank's objective is to keep the overnight rate within a band of 50 basis points (1/2 of 1%)
- In response to the subprime financial crisis, the Bank of Canada temporarily narrowed the operating band for the overnight interest rate to 25 basis points (1/4 of 1%)
- The Bank operates under a system of eight "fixed" dates throughout the year for announcing changes to the operating band

Operating Band for the Overnight Interest Rate

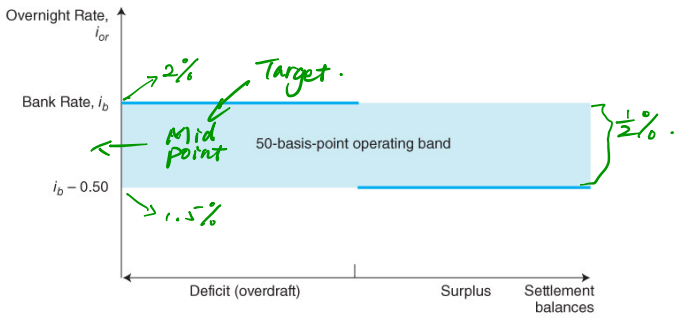


FIGURE 16-1 **Operating Band for the Overnight Interest Rate**

The Bank of Canada's Standing Facilities

- At the end of each banking day, each LVTS participant must bring its settlement balance with the Bank close to zero
- The Bank of Canada therefore stands ready (with **standing liquidity facilities**) to lend to or borrow from a participant to bring their settlement balances to zero at the end of the banking day
- Participants know with certainty the rates applicable to positive and negative settlement balances

The Bank of Canada's Standing Facilities (cont'd)

- The initiative is on the side of the LVTS participant
  - *Participant may use the Bank's lending facility to obtain overnight liquidity in case of a shortage, or*
  - *Participant may use the deposit facility to make deposits in case of excess liquidity*

- Most participants will achieve settlement clearing in a pre-settlement trading period where participants can borrow or lend among themselves. rather than through BoC. and at a better rate of interest, usually at or near the midpoint of the operating band.

The Bank of Canada and the Operating Band

- If the overnight rate increases toward the upper limit of the operating band
  - *The Bank will lend at the bank rate*
  - *Puts a ceiling on the overnight rate*

- If the overnight rate falls toward the lower limit of the operating band
  - *The Bank will accept deposits from LVTS participants at the bank rate less 50 basis points*
  - *Puts a floor on the overnight rate*

Participants may borrow and lend among themselves, but the rate of interest must stay with in the band.

- The overnight rate cannot be higher than the bank rate because a FI is unlikely to pay more than the bank rate - the rate at which it can borrow from BoC.

- The overnight interest rate cannot be lower than the settlement balance rate, because FI is not likely to lend at a rate lower than deposit rate.

The Market for Settlement Balances

- The market for settlement balances (reserves) is where the overnight interest rate is determined
- Market for reserves can be described in a symmetric channel/corridor system of interest-rate control
- Demand and Supply in the Market for Reserves
- Market equilibrium where the quantity of reserves demanded equals the quantity of reserves supplied determines the overnight rate

Equilibrium in the Market for Reserves

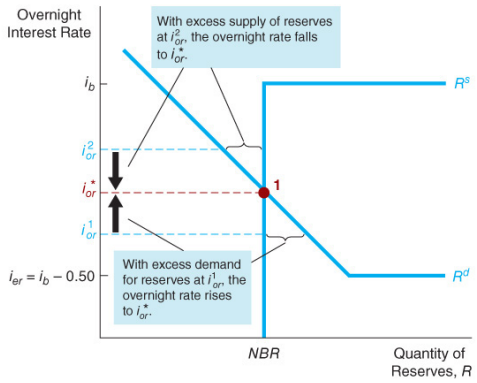


FIGURE 16-2 Equilibrium in the Market for Reserves

- As in any market, supply and demand determine the price.
- In this market, the supply of reserves and the demand for reserves determine the equilibrium overnight interest rate.

The Model:

i_b = bank rate - Upper bound of the operating band

i_{or} = overnight rate.

i_{er} = interest rate that could earned on excess reserves

$= i_b - \frac{1}{2}\%$

= settlement balance rate

- Lower bound of the band.

R^d = demand of reserves

R^s = supply of reserves

Demand Curve (R^d)

- Canadian banks have no reserve requirement. determined by law but will hold sufficient. reserves against deposits to meet their requirements

- called desired reserves

- Desired reserves = desired reserve ratio (rd) x amount of deposits.

- Excess reserves = reserves in excess of desired reserves

- Opportunity cost of holding excess reserves = lending rate − deposit rate. ior - ier.

Demand Curve

- When the overnight rate is above the interest rate paid on excess reserves, *ier*:
  - *The overnight rate decreases*
  - *The opportunity cost of holding excess reserves falls*
  - *The quantity of reserves demanded rises*
- When the overnight rate is below the interest rate paid on excess reserves *ier* :
  - *Banks keep on adding to their holdings of excess reserves indefinitely*
- Downward sloping demand curve becomes flat (infinitely elastic) at *ier*

When $i_{or} > i_{er}$, on the downward sloping portion of the demand curve, then as the ior falls, the opportunity cost of holding excess reserves falls and the quantity demanded increases.

If ior falls below ier, banks will not lend, the will add to their holding of excess reserves indefinitely which implies a perfectly elastic demand curve at ier

Supply Curve

- Non-borrowed (NBR) and borrowed reserves (BR)
  - *Cost of borrowing from Bank of Canada is the bank rate (ib)*
  - *Borrowing from Bank of Canada is a substitute for borrowing from other banks*
- If ior< ib, then banks will not borrow from the Bank of Canada and borrowed reserves are zero
  - *Supply curve will be vertical*
- As ior rises above ib, banks will borrow more and more at ib, and re-lend at ior
  - *Supply curve is horizontal (perfectly elastic) at ib*

R^S = Nonborrowed reserves (NBR) + Borrowed Reserves (BR)

NBR - vertical supply of reserves at the amount supplied by the BoC's open market operations.

i_b = bank rate, the cost of borrowing from the BoC, set at ¼% above the over night target.

- if $i_{or} < i_b$, this implies that $BR = 0$ and $R^S = NBR$
- As i_{or} increases above i_b, banks will borrow from the BoC indefinitely, and the supply curve becomes perfectly elastic at i_b.

How the Bank of Canada's Operating Procedures Limit Fluctuations in the Overnight Interest Rate

- If the equilibrium overnight interest rate is at the overnight rate target of i*
- If the demand for reserves has a large unexpected increase, the demand curve would shift to the right to *Rd*2 , where it now intersects the supply curve for reserves on the flat portion where the equilibrium overnight rate *i2 = ib*
- The Bank of Canada's operating procedures limit the fluctuations of the overnight interest rate to between ier = ib - 0.50 and ib

How the Bank of Canada's Operating Procedures Limit Fluctuations in the Overnight Interest Rate

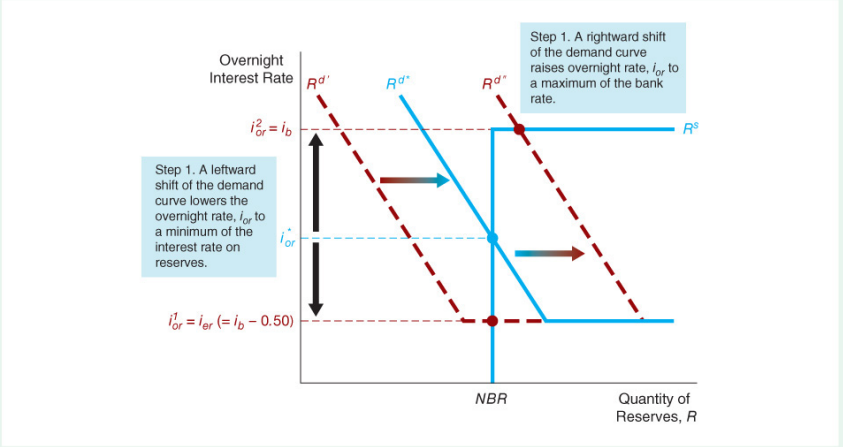


FIGURE 16-3 How the Bank of Canada's Operating Procedures Limit Fluctuations in the Overnight Interest Rate

Starting in equilibrium at i_{or}^{*}, if R^d increases so that $R^d = R^s$ on the elastic portion and $i_{or} = i_b$, then BR will continue to increase, matching the increase in R^d. and i_{or} will stay at i_b

Starting in equilibrium at i_{or}^{*}, if R^d decreases so that $R^d = R^s$ on the elastic portion and $i_{or} = i_{er}$, then the excess reserves will keep on increasing so that quantity demanded = NBR supplied.

Conclusion: the Overnight rate stays btw the i_b and i_{er}. These rates represent the max and min of overnight rates.

Inflation Rates and Inflation Targets for Canada

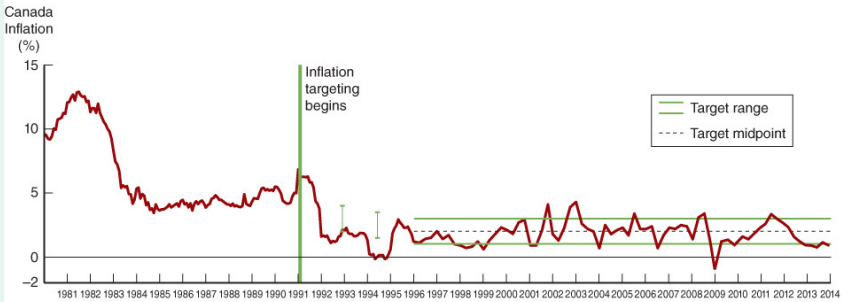


FIGURE 16-4 **Inflation Rates and Inflation Targets for Canada, 1980–2014**

Canada has significantly reduced the rate of inflation and over time has achieved its inflation targets.

Source: Ben S. Bernanke, Thomas Laubach, Frederic S. Mishkin, and Adam S. Poson, Inflation Targeting: Lessons from the International Experience (Princeton: Princeton University Press, 1999); and Federal Reserve Bank of St. Louis, FRED database: **http://research.stlouisfed.org/fred2/**.

BoC's current monetary policy goal is low and stable inflation in the range of 1% – 3%, with a target 2%.

- Success or failure of this goal is measured by the rate of change of the CPI, using core inflation as a measure of the CPI's trend.

Core inflation – CPI market minus 8 of the most volatile components.

1991 – joint announcement of inflation targets.

The Bank affects monetary policy by adjusting the target for the overnight rate.

Changes in the ONR affect the inflation rate indirectly and over a reasonably long period of time

How Monetary Policy Affects the Economy

- Changes in the overnight rate influences other interest rates and the exchange rate

- The level of short term interest rates and the exchange rate of the Canadian dollar determine the **monetary conditions** in which the economy operates

How the Bank of Canada Keeps the Rate of Inflation from Falling Below the Target Range

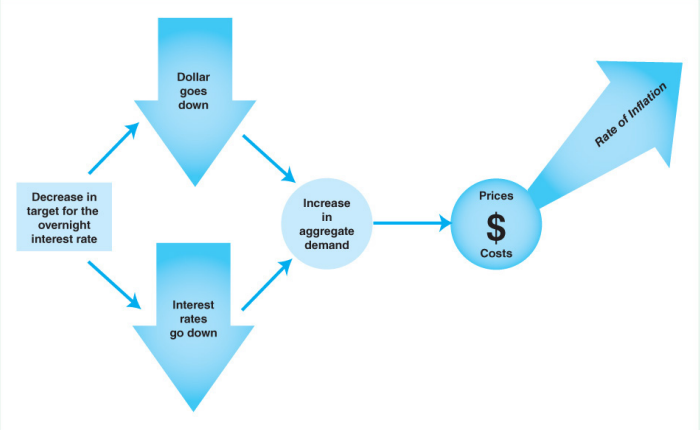


FIGURE 16-5 How the Bank of Canada Keeps the Rate of Inflation from Falling Below the Target Range

Source: Bank of Canada website: **www.bankofcanada.ca.**

How the Bank of Canada Keeps the Rate of Inflation from Moving Above the Target Range

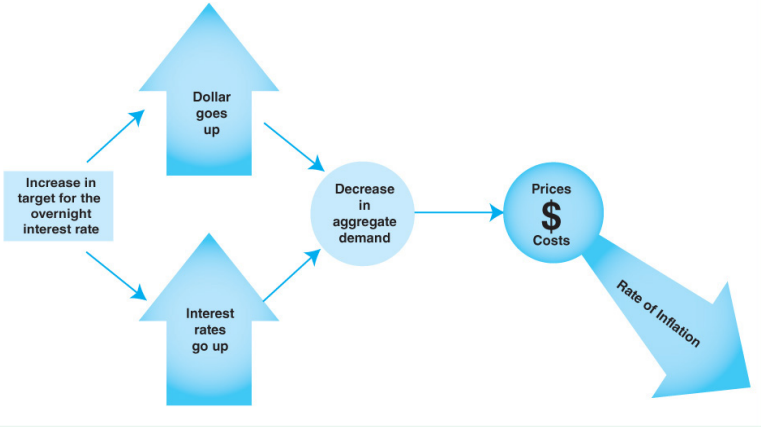


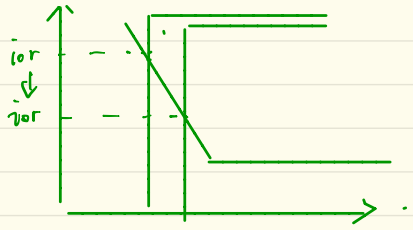
FIGURE 16-6 How the Bank of Canada Keeps the Rate of Inflation from Moving Above the Target Range

Source: Bank of Canada website: **www.bankofcanada.ca**.

Example:

How the Bank of Canada keeps the Rate of inflation from falling Below the Target Range.

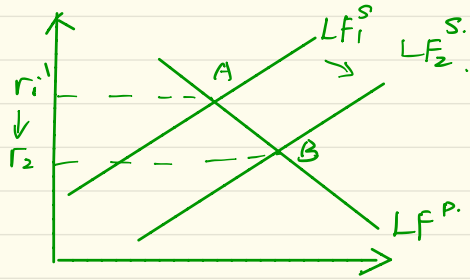
If the BoC expects a slowdown in the economy, it will decrease the target for the overnight rate to avoid recession and increase price to move closer to the target inflation rate.



How:

- Increase reserves in the reserves market.
- FIs have more reserves, will make more loans and increase the money supply.
- The result will be a lower short-term interest rate in the money market.

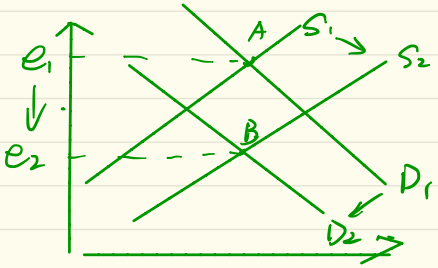
- In the short run, the increase in bank loans will increase SLF which will decrease the real interest rate in the financial market.



Result: ↑I, ↑C

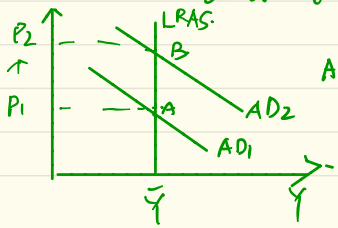
- In the foreign exchange market, a lower interest rate will decrease demand and increase supply of $CAD.

- Result will be a lower exchange rate.



Result: Export ↑ Import ↓
⇒ NX ↑.

- In other words, aggregate demand increases and the price level increases.



AD/AS Model (Goods Market)

$AD = C + I + G + NX$.

- The opposite is true.

- If the BoC is expecting inflationary pressure from an expansion in the future, it will increase the target for the overnight rate and ultimately decrease inflation.

Nominal Interest Rates and Monetary Policy

- Bank of Canada uses nominal overnight interest rate as operating instrument
- Effects on the monetary policy on economic activity are from the real interest rate affecting consumption and investment
- Short-term nominal rates affect short and long-term real interest rates under assumption of sticky prices

Open Market Operations

- Open market operations are an important monetary policy tool for many central banks
- Open market purchases:
  - *Expand bank reserves and the monetary base*
  - *Lower short-term interest rates*
  - *Raise the money supply*
- Open market sales:
  - *Shrink bank reserves and the monetary base*
  - *Raise short-term interest rates*
  - *Lower the money supply*

Repurchase Transactions

- Bank of Canada stopped conducting open market operations in Government T-bills in 1994, instead uses:
- Repos or Specials
  - ***Special Purchase and Resale Agreements*** *(special PRAs or SPRAs)*
  - *Used as a tool to reduce undesired upward pressure on the overnight interest rate*
- Reverse Repos or Reverses
  - ***Sale and Repurchase Agreements*** *(SRAs)*
  - *Used as a tool to reduce undesired downward pressure on the overnight rate*

Special PRAs

If overnight funds are traded at a rate above the target *ior*, the Bank enters into SPRAs at a price that works out to the target *ior*.

Hence, SRAs relieve undesired upward pressure on overnight interest rates

Bank of Canada			
Assets		Liabilities	
Government Securities	+$100m	Settlement Balances	+$100m

Primary Dealers			
Assets		Liabilities	
Settlement Balances	+$100m	SPRAs	+$100m

Special PRAs

If, on the other hand, overnight funds are traded at a rate *below* the target rate, the Bank of Canada enters into SRAs

Hence, sale and repurchase agreements alleviate undesired downward pressure on overnight rates

Bank of Canada				Primary Dealers			
Assets		Liabilities		Assets		Liabilities	
		Settlement Balances	-$100m	Settlement Balances	-$100m		
		SRAs	+$100m	Government Securities	+$100m		

The Mechanics of a Special PRA Operation

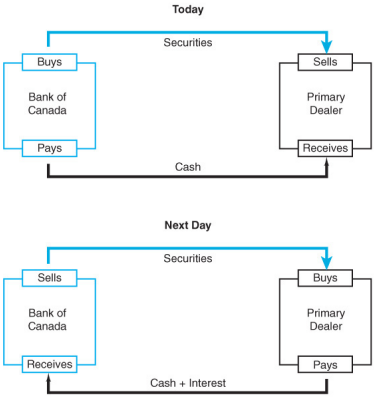


FIGURE 16-7 The Mechanics of a Special PRA Operation

Note: In a special PRA (SPRA), the Bank of Canada buys securities from a primary dealer in exchange for cash and the primary dealer agrees to buy the securities back (repurchase them) the next day at the original price plus interest, regardless of what happens in the market. In that arrangement, the primary dealer gets an overnight collateralized loan and the Bank of Canada gets some interest.

Settlement Balances Management

- Bank of Canada also targets the level of settlement balances in the system
- Typically, target level is announced the previous day
- Bank neutralizes the impact on settlement balances via open-market buyback operations
- Bank neutralizes SRA operations as well
- Shifts (transfers) of government deposits
  - *Transfer deposits from banks to Bank of Canada:* ***drawdowns***
  - *Transfer deposits from Bank of Canada to banks:* ***redeposits***

Receiver General Auctions

- Suppose the government receives $100 more from the public than it pays out
- Bank of Canada will neutralize this by arranging a net increase of $100 in government deposits

Bank of Canada				LVTS Participants			
Assets		Liabilities		Assets		Liabilities	
		Government Deposits	-$100	Settlement Balances	+$100		
		Settlement Balances	+$100	Government Deposits	+$100		

Receiver General Auctions

- Suppose instead there is a net disbursement of $100 (government pays more than it receives)
- Bank of Canada will neutralize this by arranging a net decrease of $100 in government deposits

Bank of Canada				LVTS Participants			
Assets		Liabilities		Assets		Liabilities	
		Government Deposits	+$100	Settlement Balances	-$100		
		Settlement Balances	-$100	Government Deposits	-$100		

Swaps with the Exchange Fund Account

- The Exchange Fund Account is the government holding of foreign exchange reserves
- Bank of Canada can buy or sell foreign currency assets
- For example, suppose the Bank of Canada buys $100:

Bank of Canada			
Assets		Liabilities	
Foreign Exchange	+$100	Government Deposits	+$100

Government of Canada			
Assets		Liabilities	
Exchange Fund Account	-$100		
Deposits at the Bank of Canada	+$100		

Bank of Canada Lending

- Bank stands ready to lend overnight settlement balances to LVTS participants with negative clearing balances
- Lending rate is ib
- Large increase in demand for reserves shifts demand right and equilibrium ior increases
- At ib, the **standing lending facility** puts ceiling on overnight rate

How the Bank of Canada's Standing Facility Puts a Ceiling on the Overnight Interest Rate

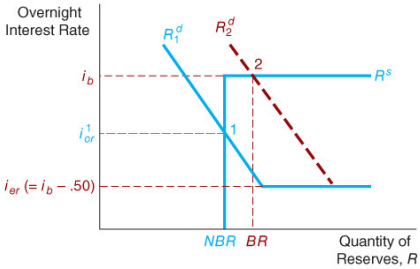


FIGURE 16-8 How the Bank of Canada's Standing Facility Puts a Ceiling on the Overnight Interest Rate

The rightward shift of the demand curve for reserves from R_1^d to R_2^d moves the equilibrium from point 1 to point 2 where $i_{or} = i_{lr}$ and borrowed reserves increase from zero to *BR*.

Lender of Last Resort

- The Bank of Canada is important in preventing financial panics
- Acts as **lender of last resort**
- Provides emergency lending assistance (against eligible collateral) for maximum of 6 months
- Prevents bank failures and financial panics

- Why not just rely on CDIC?
  - *CDIC insurance fund is small fraction of total deposits*
  - *Large-denomination deposits are not guaranteed by CDIC*

Bank of Canada Advances to Members of the Canadian Payments Association

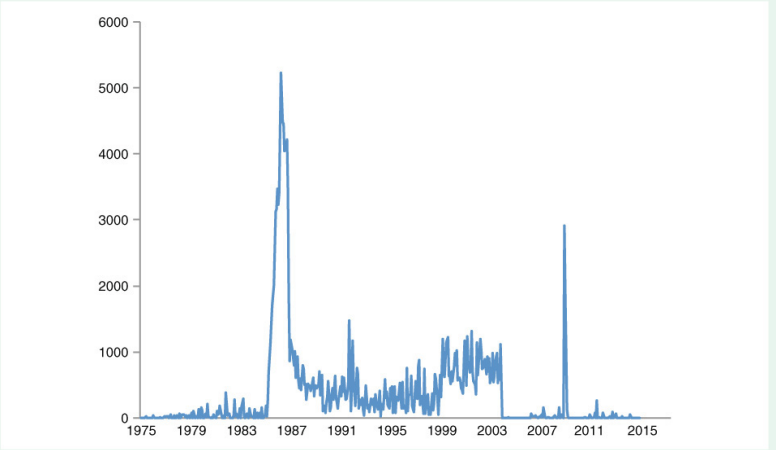


FIGURE 16-9 **Bank of Canada Advances to Members of the Canadian Payments Association, 1975–2014 (in millions of dollars)**

Source: Statistics Canada CANSIM series V36663.

Nonconventional Monetary Policy Tools

- In normal times, conventional policy tools are enough
- In time of financial crisis, they are no longer effective
  - *The financial system seizes up to such an extent that it becomes unable to allocate capital*
  - *The negative shock to the economy can lead to the **zero-lower-bound problem**, where the central bank is unable to lower short-term interest rates*

- Central banks therefore need non-interest-rate tools known as **nonconventional monetary policy tools**

Liquidity Provision

- The Bank of Canada introduced new tools during the financial crisis to address aggregate system liquidity issues
- Term Purchase and Resale Agreements (**Term PRAs**)
  - *Term longer than one day; typically 28 business days*
- Term Securities Lending
  - *Increases supply of high-quality securities that could be used for collateral*

Large-Scale Asset Purchases

- Normally, open market operations involve only the purchase or sale of government securities (particularly short-term securities)
- During the global financial crisis, central banks expanded the range of assets they purchased
  - *In November 2008, the Federal Reserve purchased $1.25 trillion of mortgage-backed securities*
  - *In November 2010, the Fed began purchasing $600 billion in long-term U.S. Treasury securities*

The Expansion of the Federal Reserve's Balance Sheet, 2007-2014

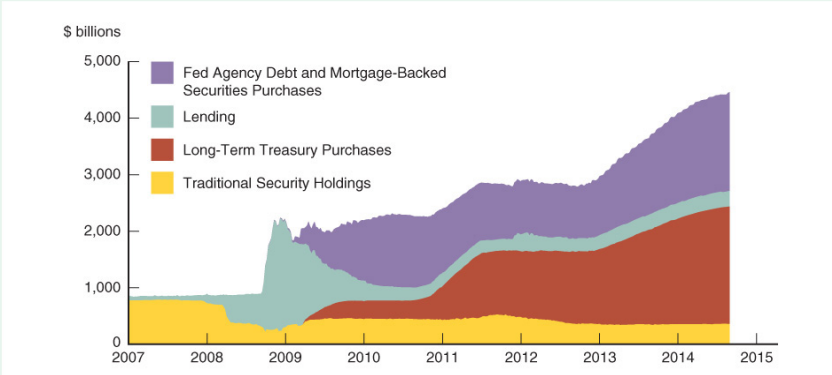


FIGURE 16-10 The Expansion of the Federal Reserve's Balance Sheet, 2007–2014

Quantitative Easing Versus Credit Easing

- Expansion of central bank balance sheets is referred to as **quantitative easing**
  - *It leads to a huge increase in the monetary base*

- Will this stimulate the economy in the near term and produce inflation down the road?
  - *Balance sheet expansion does not necessarily increase the money supply, since excess reserves can increase*
  - *Short-term rates are at zero lower bound*

Quantitative Easing in the Channel/Corridor System

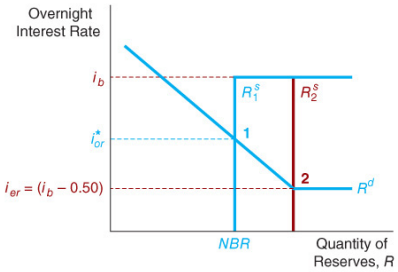


FIGURE 16-11 **Quantitative Easing in the Channel/Corridor System**

Excess Reserves of Depository Institutions in the United States

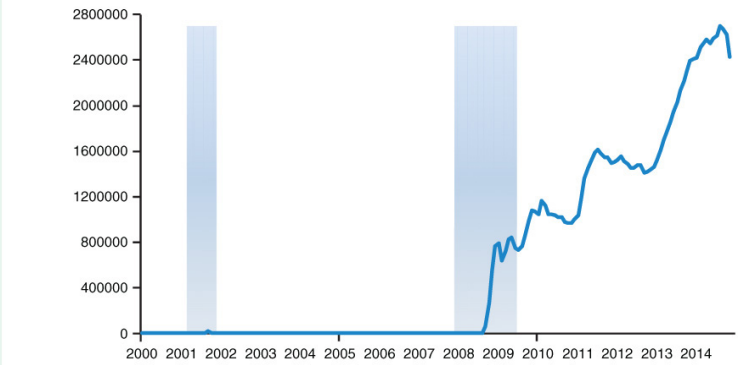


FIGURE 16-12 **Excess Reserves of Depository Institutions in the United States (in $ billions)**

Source: Federal Reserve Bank of St. Louis FRED database.

Quantitative Easing Versus Credit Easing

- Was nonconventional monetary policy actions during the crisis therefore ineffective?
- Former Fed Chair Ben Bernanke argues no
  - *Fed's policies were directed not at expanding the balance sheet of the Fed, but rather at* ***credit easing***
  - *Alters the composition of the Fed's balance sheet in order to improve the functioning of particular segments of the credit markets*
  - *Liquidity helps unfreeze particular markets and increases demand for certain securities and lowers rates (i.e., long-term)*

Forward Guidance and the Commitment to Future Policy Actions

- Although short-term interest rates could be at zero, central banks can take different routes to lower long-term rates
- In particular, they can make commitments to keep policy rates at zero for a long period of time
  - *Lowers expectations of future short-term rates*
  - *Commonly referred to as* ***forward guidance***
  - *Can be conditional or unconditional*

Monetary Policy Tools of the Federal Reserve

- Federal Funds Rate
- Open Market Operations
- Discount Lending
- Required Reserves
- Interest on Reserves

The Federal Funds Rate

- The Fed's lending of reserves to banks is called discount window lending
- The interest rate charged banks for these loans is called the discount rate
- The primary indicator of the stance of monetary policy in the United States is the federal funds rate, the interest rate on overnight loans of reserves (known as federal funds) that banks trade among themselves

Equilibrium in the Market for Reserves in the United States

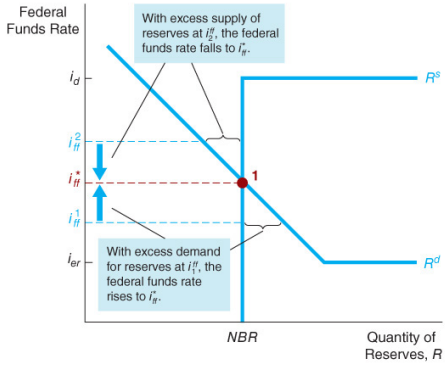


FIGURE 16-13 Equilibrium in the Market for Reserves in the United States

Equilibrium occurs at the intersection of the supply curve R^s and the demand curve R^d, at point 1 and an interest rate of i_{ff}^*.

Open Market Operations

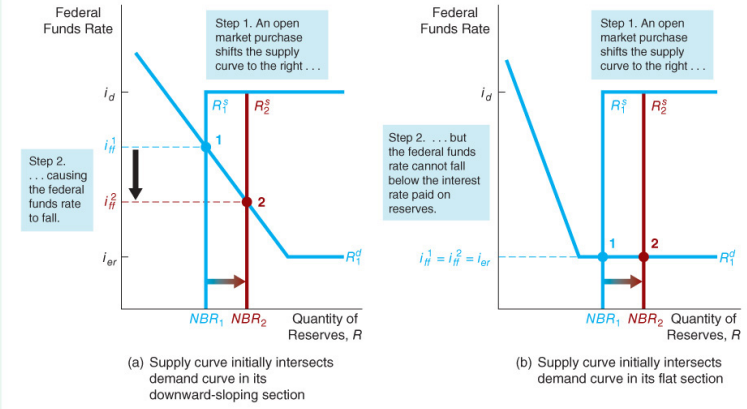


FIGURE 16-14 Response to an Open Market Operation

In open market purchase increases nonborrowed reserves, and hence the reserves supplied, and shifts the supply curve from R_1^s to R_2^s. In panel (a), the equilibrium moves from point 1 to point 2, lowering the federal funds rate from to i_{ff}^1 to i_{ff}^2. In panel (b), the equilibrium moves from point 1 to point 2, but the federal funds rate remains unchanged, $i_{ff}^1 = i_{ff}^2 = i_{er}$.

Discount Lending

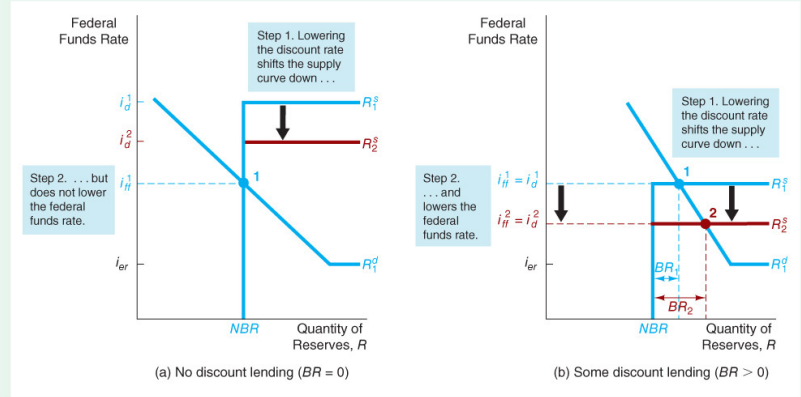


FIGURE 16-15 Response to a Change in the Discount Rate

In panel (a), when the discount rate is lowered by the Fed from i_d^1 to i_d^2, the horizontal section of the supply curve falls, as in R_2^s, and the equilibrium federal funds rate remains unchanged at i_{ff}^1. In panel (b), when the discount rate is lowered by the Fed from i_d^1 to i_d^2, the horizontal section of the supply curve R_2^s falls, and the equilibrium federal funds rate falls from i_{ff}^1 to i_{ff}^2 as borrowed reserves increase.

Required Reserves

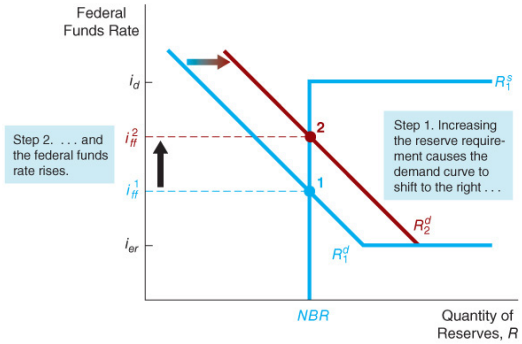


FIGURE 16-16 **Response to a Change in Required Reserves**

When the Fed raises reserve requirements, required reserves increase, which raises the demand for reserves. The demand curve shifts from R_1^d to R_2^d, the equilibrium moves from point 1 to point 2, and the federal fund rate rises from i_{ff}^1 to i_{ff}^2.

Change in the Interest Rate on Reserves

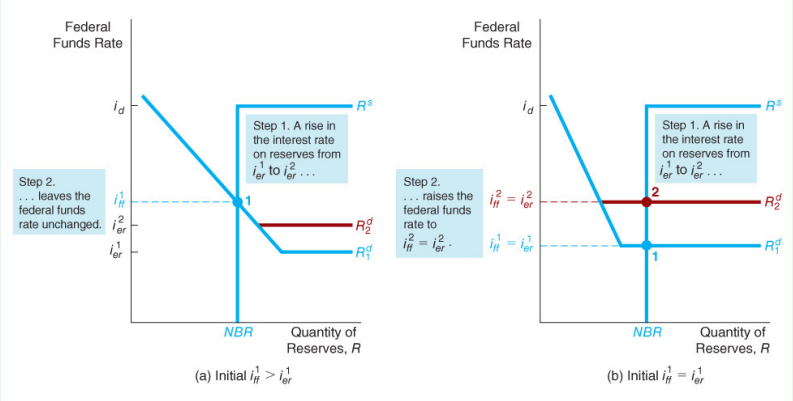


FIGURE 16-17 **Response to a Change in the Interest Rate on Reserves**

In panel (a), when the equilibrium federal funds rate is above the interest rate paid on reserves, a rise in the interest rate on reserves from i_{er}^1 to i_{er}^2 raises the horizontal section of the demand curve, as in R_1^d, but the equilibrium federal funds rate remains unchanged at i_{ff}^1. In panel (b), when the equilibrium federal funds rate is equal to the interest rate paid on reserves, a rise in the interest rate on reserves from i_{er}^1 to i_{er}^2 raises the equilibrium federal funds rate to $i_{ff}^1 = i_{er}^1$ to $i_{ff}^2 = i_{er}^2$.

Monetary Policy Tools of the European Central Bank

- Open market operations
  - *Main refinancing operations*
  - *Longer-term refinancing operations*
- Lending to banks
  - *Marginal lending facility/marginal lending rate*
  - *Deposit facility*
- Reserve Requirements
  - *2% of the total amount of checking deposits and other short-term deposits*
  - *Pays interest on those deposits so cost of complying is low*