

**Lecture Notes on**

**MONEY, BANKING,  
AND FINANCIAL MARKETS**

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# Chapter 17b: Federal Reserve Operating Procedures

## 1. A Model of Reserves and the Federal Funds Rate

Demand for Reserves

Supply of Reserves

Market Equilibrium

## 2. Changes in the Federal Funds Rate Target

## 3. Operation of the Discount Window

Our previous analysis showed how, in practice, the Federal Reserve sets interest rate targets for monetary policy that help it achieve its goals for employment, economic growth, inflation, and financial market and interest rate stability.

Now, we will extend that analysis to provide a more detailed and realistic view of how the Federal Reserve's operating procedures actually work.

Here, in particular, we'll note that the Federal Reserve's interest rate target is a target for the federal funds rate—the rate charged on loans between banks of deposits at the Fed—that is, on loans of reserves.

Hence, we'll begin by constructing a model of reserves and the federal funds rate, first by considering banks' demand for reserves and then by considering the Fed's supply of reserves. As usual, the intersection of the demand and supply curves will determine the equilibrium in the market for federal funds.

Then we'll use our model to see how the Fed brings about changes in its federal funds rate target and to see what those target changes imply for the overall stance of monetary policy.

Finally, we'll use our model to see how the Fed operates the discount window in its role as a lender of last resort.

# 1 A Model of Reserves and the Federal Funds Rate

In practice, the Federal Reserve's interest rate target is a target for the federal funds rate—the rate charged on interbank loans of reserves.

To see how the Fed's targeting procedures work, we need to begin by constructing a model of the market for reserves.

We'll do this in the usual way: first by considering the demand for reserves and then by considering the supply of reserves.

Our demand-and-supply analysis will allow us to see how the Fed hits its target for the federal funds rate as well as what happens when it changes that federal funds rate target.

## 1.1 Demand for Reserves

Recall from our previous analysis that total reserves consist of required reserves plus excess reserves:

$$R = RR + ER,$$

where

$R$  = total reserves

$RR$  = required reserves

$ER$  = excess reserves.

Recall also that, by law, banks must hold a fraction of their checkable deposits as required reserves:

$$RR = r \times D,$$

where

$r$  = required reserve ratio (10%)

$D$  = checkable deposits.

Checkable deposits pay interest, but at a lower rate than other assets, since they offer check writing privileges.

Hence, when interest rates rise, individuals and non-bank corporations transfer funds out of deposits and into other assets.

Hence, when interest rates rise, required reserves fall.

Likewise, from a bank's perspective excess reserves pay no interest.

Hence, when the interest rates rise, banks hold fewer excess reserves.

Recall that we saw evidence of this negative relationship between interest rates and excess reserves in Mishkin's Chapter 16, Figure 1 (p.381).

In particular, when the federal funds rate rises, a bank holding excess reserves will want to lend some of those reserves out to other banks and earn the higher federal funds rate.

Since both required reserves  $RR$  and excess reserves  $ER$  fall when interest rates rise, total reserves  $R$  fall when interest rates rise.

Thus, we can trace out a downward-sloping demand curve for reserves.

## 1.2 Supply of Reserves

To analyze the demand for reserves, we decomposed total reserves  $R$  into required reserves  $RR$  and excess reserves  $ER$ .

To analyze the way that the Federal Reserve supplies reserves to the banking system, it is useful to decompose the total amount of reserves  $R$  in a different way:

$DL = \text{discount loans} = \text{reserves borrowed from the Fed}$

$$R_n = \text{nonborrowed reserves} = R - DL.$$

In practice, the Fed:

1. Sets a target  $i_f^*$  for the federal funds rate.
2. Determines the amount of nonborrowed reserves  $R_n^*$  it must supply to make the equilibrium federal funds equal to  $f^*$ .
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  $i_d$ .

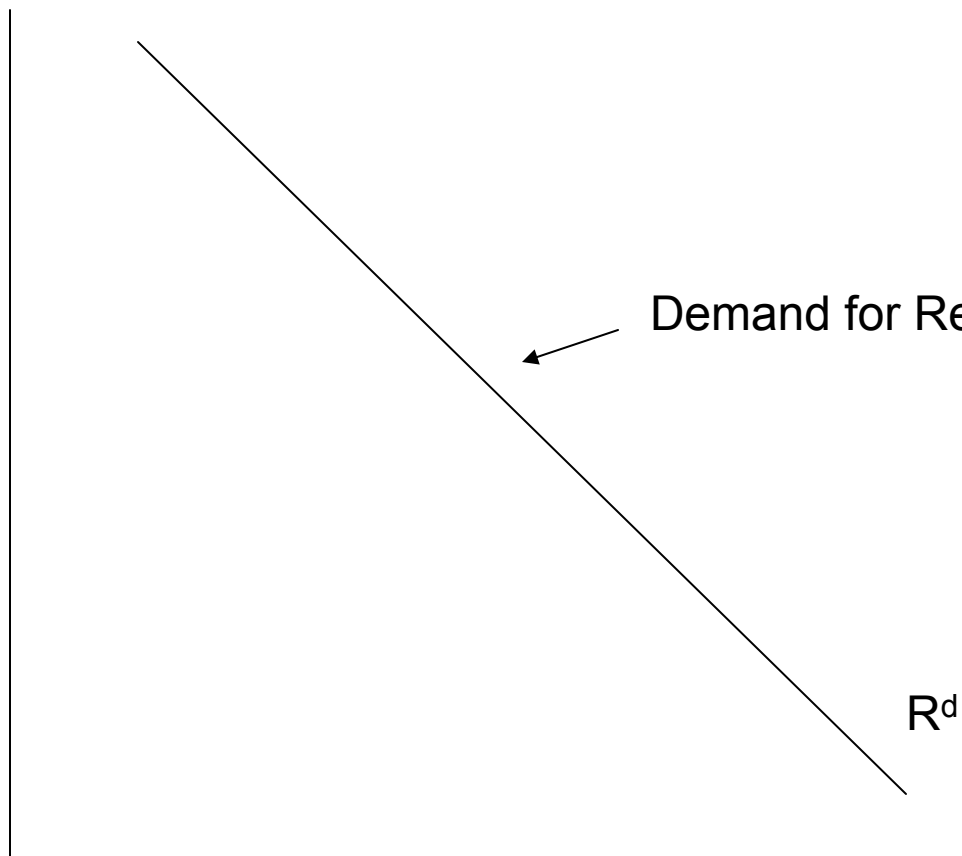
These operating procedures give the supply curve for reserves an unusual shape:

When the federal funds rate  $i_f$  is below the discount rate  $i_d$ , it is cheaper for a bank to borrow reserves from another bank than it is for a bank to obtain a discount loan.

Hence, when  $i_f$  is below  $i_d$ , banks will not use the discount window and the supply of reserves is fixed at  $R_n^*$ .

Below  $i_d$ , therefore, the supply curve for reserves is vertical.

Federal Funds  
Rate  $i_f$



Demand for Reserves

$R^d$

Quantity of Reserves  $R$

Federal Funds Rate  $i_f$

Discount rate

Federal funds rate target

$i_d$

$i_f^*$

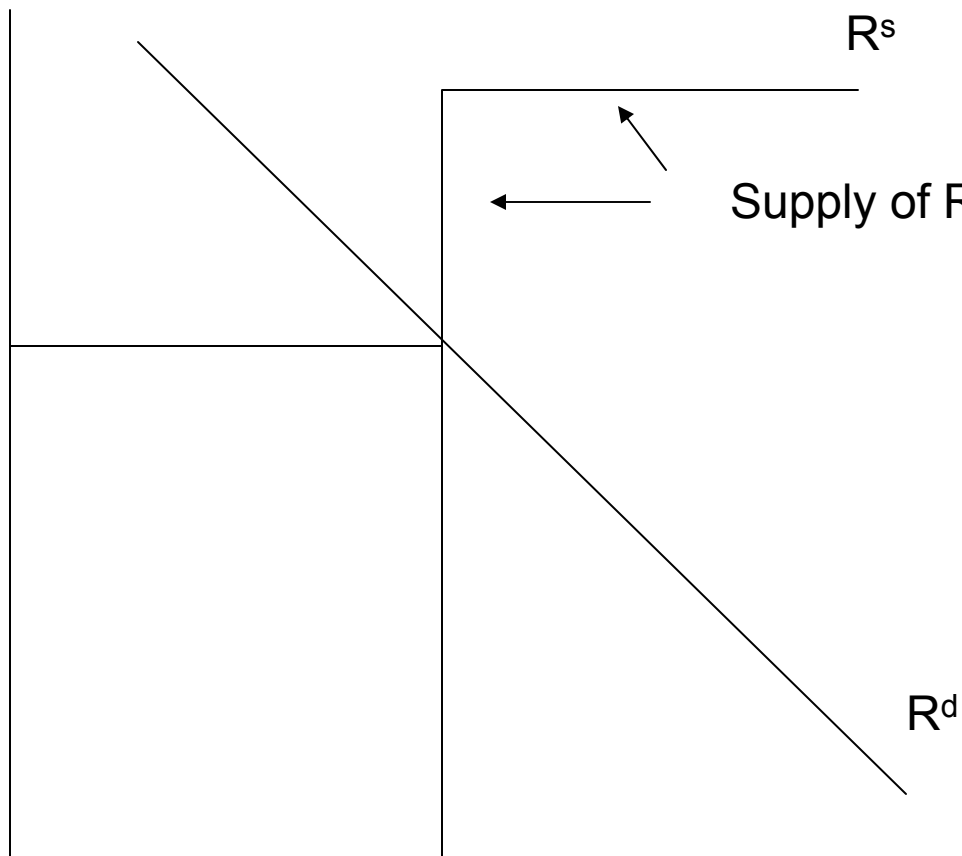
$R_n^*$

Quantity of Reserves  $R$

$R^s$

$R^d$

Supply of Reserves



When the federal funds rate rises to  $i_d$  however, banks will become willing to use the discount window.

Since the Fed stands willing to make as many discount loans as banks want at the discount rate  $i_d$ , the supply curve for reserves then becomes horizontal.

### 1.3 Market Equilibrium

As usual, equilibrium occurs at the point where the demand and supply curves intersect.

Under normal conditions:

1. The equilibrium federal funds rate equals the Fed's target  $i_f^*$ .
2. The discount rate  $i_d$  is above the equilibrium federal funds rate.
3. The equilibrium level of reserves equals  $R_n^*$ .
4. The Fed does not make any discount loans.

## 2 Changes in the Federal Funds Rate Target

What happens when the Federal Reserve raises its federal funds rate target?

Suppose that initially, the federal funds rate target is  $i_f^*$  and that the Federal Reserve hits this target by supplying  $R_n^*$  in nonborrowed reserves.

To raise the target to  $i_f^{**}$ , the Fed must decrease the supply of nonborrowed reserves to  $R_n^{**}$ .

This shifts the supply curve for reserves, while leaving the demand curve unchanged.

The equilibrium federal funds rate equals the new target  $i_f^{**}$ .

To decrease the supply of nonborrowed reserves, the Fed conducts an open market sale.

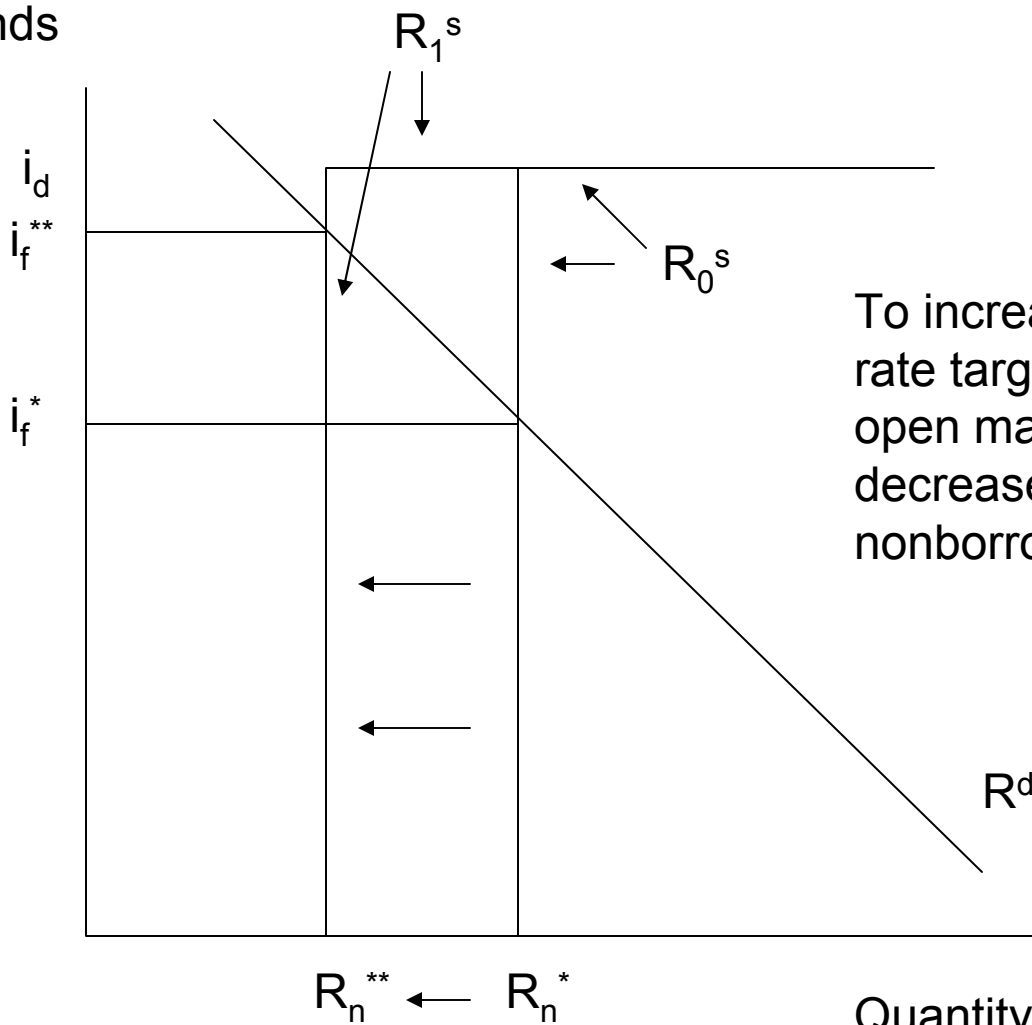
This open market sale also works to decrease the monetary base and the money supply as a whole.

Hence, the increase in the federal funds rate target is associated with a smaller money supply—that is, a tighter monetary policy.

Similarly, to lower its federal funds rate target, the Fed must increase the supply of nonborrowed reserves by conducting an open market purchase.

This open market purchase also works to increase the monetary base and the money supply as a whole.

Federal Funds  
Rate  $i_f$



To increase its federal funds  
rate target, the Fed must use  
open market operations to  
decrease the supply of  
nonborrowed reserves.

Hence, a decrease in the federal funds rate target is associated with a larger money supply—that is, a looser monetary policy.

### 3 Operation of the Discount Window

As illustrated above, the Fed sets the discount rate above its federal funds rate target.

Hence, most of the time, discount lending is zero.

During a financial panic, however, the demand for reserves may unexpectedly increase by a large amount.

Under such circumstances, banks want to hold more reserves at any given interest rate: the demand curve for reserves shifts out.

Since the Fed stands ready to make discount loans at the discount rate  $i_d$ , the equilibrium federal funds rate will never rise above  $i_d$ .

Thus, the Fed's operating procedures allow it to act as a lender of last resort during a panic, and prevent the equilibrium federal funds rate from rising too far above its target.

### 4 Conclusion

Current Federal Reserve operating procedures focus on targeting the federal funds rate.

When the Fed increases its federal funds rate target, it conducts open market sales that contract the money supply.

And when the Fed decreases its federal funds rate target, it conducts open market purchases that expand the money supply.

Current operating procedures also allow the Fed to act as a lender of last resort.

By setting the discount rate above its federal funds rate target and by standing ready to make discount loans at that discount rate, the Fed limits the extent to which the federal funds rate can rise during a financial panic.

Federal Funds Rate  $i_f$

$i_p = i_d$

$i_f^*$

$R^s$

The demand for reserves may increase sharply during a financial panic.

$R_1^d$

$R_0^d$

$R_n^*$

Quantity of Reserves  $R$

But the Fed's operating procedures won't let the federal funds rate rise above the discount rate!

