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The Discount Rate: Experience Under Reserve Targeting

By Gordon H. Sellon, Jr., and Diane Seibert

Since the change in Federal Reserve operating procedures from interest rate to reserve targeting in October 1979, the discount rate—the interest rate charged to depository institutions when they borrow from a Federal Reserve Bank—has had a more visible role in the implementation of monetary policy. In addition to changes in the basic discount rate, the Federal Reserve has at times imposed a surcharge rate on large banks that borrow frequently.

The purpose of this article is to examine the impact of the basic discount rate and the discount rate surcharge on interest rates and borrowing since the implementation of reserve targeting.[1] The article is divided into three sections. The first two contain analyses of the short-run effects of the basic discount rate and the discount rate surcharge on interest rates and borrowing under reserve targeting. The final section provides empirical evidence on the impact of discount rate changes since October 1979 and on the behavior of surcharge borrowing.

THE BASIC DISCOUNT RATE

The basic discount rate is the interest rate charged for short-term borrowing from the Federal Reserve, which is primarily intended to allow depository institutions time to make more basic adjustments in their portfolios in response to unexpected changes in their assets and liabilities. The directors of the regional Federal Reserve Banks make recommendations concerning changes in the discount rate, which are subject to approval by the Board of Governors.[2]

Borrowing at the discount window plays an important part in the determination of short-term interest rates and in the growth of money and credit in the economy. Generally speaking, depository institutions have a need for reserves to support the growth of money and credit. This demand for reserves can be met in two ways: through reserves supplied by the Federal Reserve using open market operations and by

[1] Borrowing at the discount window can occur under a variety of programs: adjustment credit, seasonal credit, and other extended credit. For the purposes of this article, borrowing consists of adjustment and seasonal credit. Borrowing under the other extended credit program is treated as part of nonborrowed reserves.

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[2] Two recent studies of the role of discount policy under reserve targeting are P. Keir, "The Impact of Discount Policy Procedures on the Effectiveness of Reserve Targeting" in *New Monetary Control Procedures,* Federal Reserve Staff Study—Volume I, Board of Governors of the Federal Reserve System, February 1981, and G. H. Sellon, Jr., "The Role of the Discount Rate in Monetary Policy: A Theoretical Analysis," *Economic Review,* Federal Reserve Bank of Kansas City, June 1980.

reserves provided through the discount window. By varying the discount rate, the price of borrowed reserves, the Federal Reserve can influence the use of the discount window as a source of funds and so cause depository institutions to undertake balance sheet adjustments that affect market interest rates and the growth of money and credit.

Analytical Framework

The impact of changes in the basic discount rate on discount window borrowing and interest rates can be analyzed by means of the following simple model of the demand and supply of borrowed reserves:

(1) $BR^D = \overline{BR} + b\,(rF - rD)$

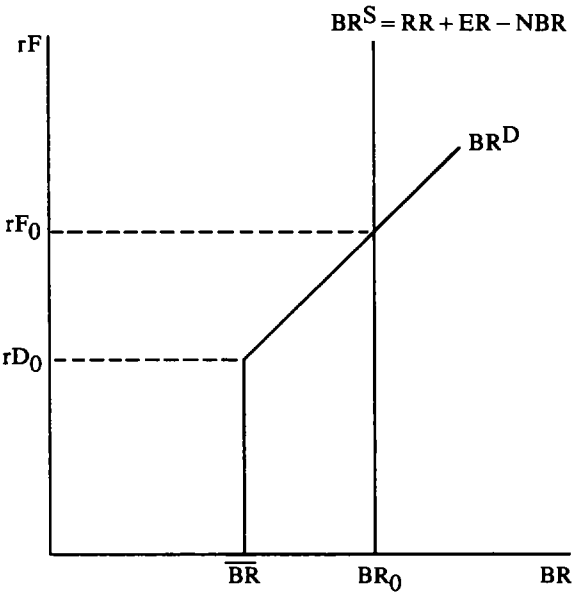
(2) $BR^S = RR + ER - NBR$

In equation (1), depository institutions' demand for borrowed reserves can be broken down into two parts. The term $\overline{BR}$ represents that part of borrowing that is insensitive to interest rates. This is a frictional level of borrowing that would occur even with the federal funds rate, rF, equal to or below the discount rate, rD.

The second term in equation (1) represents that part of the demand for borrowing that is sensitive to the positive spread between the funds rate and the discount rate. The higher the funds rate relative to the discount rate, the more incentive there is to borrow from the Federal Reserve rather than in the federal funds market. Changes in the discount rate can affect the demand for borrowed reserves to the extent that these changes alter the spread between the funds rate and the discount rate. Thus, if the discount rate is increased relative to the funds rate, borrowing will tend to be reduced. Alternatively, if the discount rate is lowered relative to the funds rate, borrowing will tend to increase.

The major factors influencing the supply of borrowed reserves are shown in equation (2).

Figure 1



Other things equal, an increase in required reserves, RR, or excess reserves, ER, tends to increase the need for institutions to use the discount window. In contrast, a greater quantity of nonborrowed reserves, NBR, supplied by the Federal Reserve through open market operations, tends to reduce the need for discount window borrowing.

A graphic illustration of this model is shown in Figure 1. When the funds rate, rF, is below the discount rate, rD_0, institutions have little incentive to use the discount window so that the demand for borrowing, BR^D, consists only of interest-insensitive borrowing, $\overline{BR}$. As the funds rate rises above the discount rate, however, the discount window becomes more attractive as a source of funds so that the demand for borrowed reserves increases. Thus, for example, with a funds rate of rF_0 and discount rate, rD_0, total borrowing, BR, rises to BR_0.

Unlike the demand for borrowed reserves, the supply of borrowed reserves is not sensitive to interest rates. Thus, in Figure 1, it is shown

Figure 2

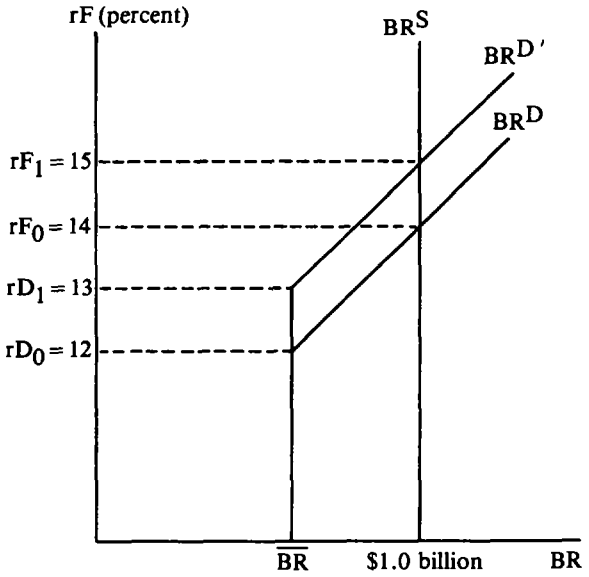
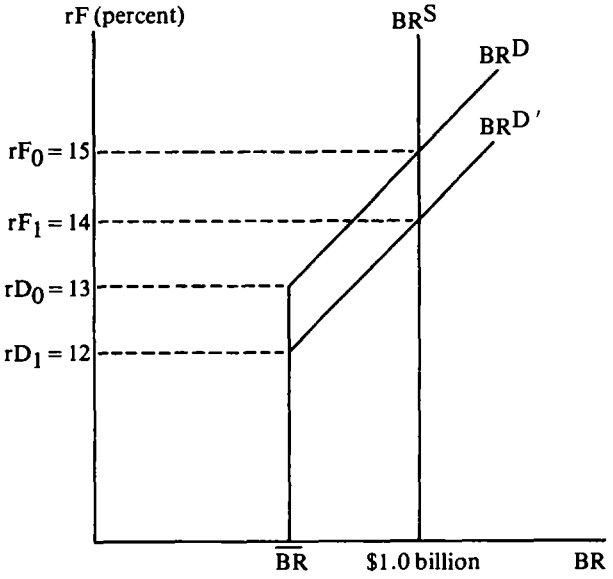


Figure 3



as a vertical line BR^S. The interest insensitivity of the supply curve results from several important assumptions. First, it is assumed that a system of lagged reserve accounting is in effect so that required reserves in a given week do not depend upon deposits or interest rates in that week.[3] Second, excess reserves are taken to be unresponsive to interest rate changes. Finally, the Federal Reserve is considered to be using a nonborrowed reserves operating target so that the quantity of nonborrowed reserves is given and is not varied in response to interest rate changes.

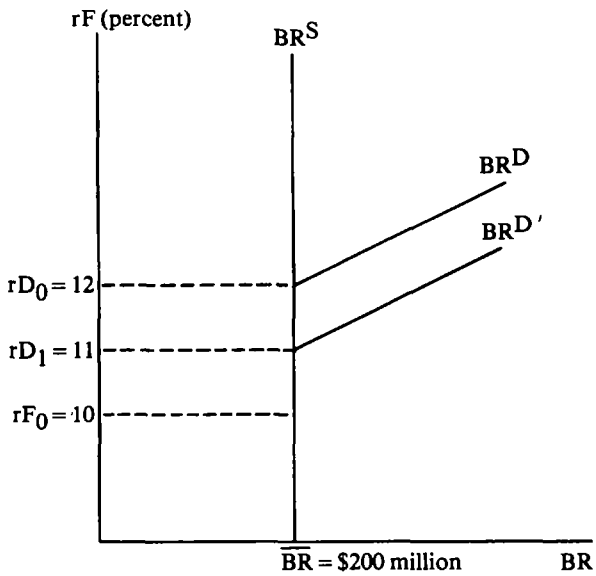
The Impact of Discount Rate Changes

This framework can be used to examine the impact of changes in the basic discount rate. In general, the most important determinant of whether discount rate changes can have an effect on market rates is the existence of a positive spread between the funds rate and the discount rate. If the funds rate is above the discount rate, some interest-sensitive borrowing will occur. In this situation, discount rate changes affect market rates by altering the demand for borrowed reserves. In contrast, if the funds rate is below the discount rate, so that the discount rate is a penalty rate, discount rate changes have no impact on market rates. The reason is that with a penalty discount rate, there is no interest-sensitive borrowing. As a consequence, discount rate changes have no effect on the demand for borrowed reserves and, hence, no impact on market interest rates.[4]

[3] Under a lagged reserve accounting system, changes in deposits in the current week have no effect on banks' required reserves. This reduces the responsiveness of the demand for total reserves to market interest rates, since interest rate effects on money demand are not transmitted to required reserves in the current statement week.

[4] Under lagged reserve accounting, the existence of a penalty discount rate may make it difficult for the Federal Reserve to employ a nonborrowed reserve operating procedure. For a more detailed discussion, see J. A. Cacy, B. Higgins, and G. H. Sellon, Jr., "Should the Discount Rate be a Penalty Rate?" *Economic Review*, Federal Reserve Bank of Kansas City, January 1981.

Figure 4



A more detailed analysis of discount rate changes is shown in Figures 2-4. Consider, first, the implications of an increase in the basic discount rate. In Figure 2, initially the discount rate, rD_0, is 12 percent, the federal funds rate, rF_0, is 14 percent, and discount window borrowing is $1.0 billion. An increase in the discount rate to 13 percent reduces the demand for borrowed reserves so that the BR^D curve shifts to $BR^{D'}$. As a result of this shift, the funds rate increases to 15 percent, and the amount of discount window borrowing remains unchanged at $1.0 billion. Thus, under the conditions shown in Figure 2, a 1 percent increase in the basic discount rate results in a 1 percent rise in the federal funds rate but no change in total discount window borrowing.

The results depend importantly on the assumptions of lagged reserve accounting and the use of a nonborrowed reserve targeting procedure.[5] With these assumptions, the supply of borrowed reserves in a given week is essentially fixed. That is, in the aggregate, depository institutions must borrow the quantity that is supplied. When the discount rate is increased, some banks are initially discouraged from using the discount window as a source of funds. Instead, they attempt to meet their reserve needs in the federal funds market. However, with a fixed supply of reserves, their actions bid up the funds rate until the original spread between the funds rate and discount rate is restored, leaving aggregate borrowing unchanged. Thus, with lagged reserve accounting and a fixed quantity of nonborrowed reserves, discount rate increases have an immediate one-for-one effect on the funds rate but no immediate impact on the quantity of discount window borrowing.[6]

The impact of a reduction in the basic discount rate is somewhat more complicated. In

[5] Alternatively, under a contemporaneous reserve accounting system, changes in deposits in the current week would affect required reserves in that week. As a result, the demand for total reserves in the current week would be responsive to interest rates as would the supply of borrowed reserves in equation (2). In this environment, discount rate changes would have less than a one-for-one impact on the funds rate and would affect the quantity of reserves borrowed. Similar results would be obtained if excess reserves were interest sensitive. Furthermore, if the Federal Reserve targeted interest rates instead of nonborrowed reserves, discount rate changes would not have any effect on market rates but would affect the amount of reserves borrowed. In this situation, discount rate changes would be offset by changes in nonborrowed reserves, so that there would not be a net effect on market rates. For a further discussion of discount rate changes under different operating targets, see G. H. Sellon, Jr., "The Role of the Discount Rate in Monetary Policy." Additional information on the distinction between lagged and contemporaneous reserve accounting can be found in D. S. Jones, "Contemporaneous vs. Lagged Reserve Accounting: Implications for Monetary Control," *Economic Review*, Federal Reserve Bank of Kansas City, November 1981.

[6] The results of discount rate increases differ considerably when the discount rate is a penalty rate. As indicated above, in this situation discount rate increases would have no impact on market rates. However, as this situation is unlikely to arise in practice, it is not afforded a detailed examination.

practice, the Federal Reserve has cut the discount rate in both a penalty rate and a nonpenalty rate situation. Thus, two cases must be distinguished, depending on whether the discount rate is below or above the funds rate when the discount rate is lowered. In Figure 3, initially the discount rate is 13 percent, the funds rate is 15 percent, and borrowing is $1.0 billion. A decrease in the discount rate to 12 percent shifts the demand for borrowed reserves from BR^D to $BR^{D'}$, resulting in a reduction of the funds rate to 14 percent with borrowing at $1.0 billion. In this situation, the effects of a reduction in the discount rate are symmetrical with those of a discount rate increase. A 1 percentage point cut in the discount rate lowers the funds rate by a full percentage point but leaves aggregate discount window borrowing unchanged.

Different results are obtained, however, if the discount rate is above the funds rate when the discount rate is reduced. In Figure 4, the discount rate is initially at 12 percent while the funds rate is 10 percent. Since the funds rate is below the discount rate, there is no incentive for institutions to use the discount window, so that borrowing is at a frictional level of $200 million. In these circumstances a cut in the basic discount rate from 12 percent to 11 percent shifts the demand for borrowed reserves from BR^D to $BR^{D'}$. However, since there is no interest-sensitive borrowing, the reduction in the discount rate has no impact on the funds rate or the frictional level of borrowing. Thus, if the discount rate is above the funds rate so that the discount rate is a penalty rate, discount rate reductions have no impact on interest rates or borrowing.[7]

[7] Even in a penalty rate environment, a discount rate reduction may affect interest rates to the extent that the reduction is perceived as a signal of future Federal Reserve policy.

THE DISCOUNT RATE SURCHARGE

In March 1980, the Federal Reserve introduced a discount rate surcharge which applied to large banks that made frequent use of the discount window. The purpose of the surcharge was to prevent large banks with access to the money markets from borrowing excessively without imposing a higher cost on small banks with limited access to alternative sources of funds. The surcharge was applied to banks with deposits over $500 million that borrowed for two consecutive weeks or for more than four weeks in a calendar quarter.[8]

When introduced on March 17, 1980, the discount rate surcharge was 3 percent. Thus, large banks subject to the surcharge would pay the basic discount rate of 13 percent plus the 3 percent surcharge, or a total of 16 percent. The surcharge was removed on May 8, 1980. Subsequently, the surcharge was reintroduced on November 17, 1980, and remained in effect until November 17, 1981. During this time, the surcharge rate ranged from 2 to 4 percent.

The use of a discount rate surcharge can be expected to affect both the pattern of discount window borrowing and the level of short-term interest rates. The behavior of large banks depends on whether they are potentially subject to the surcharge and on the relative price of funds obtained in the market as compared to the price at the discount window.[9] For example,

[8] The formula for applying the surcharge was changed from a calendar quarter to a moving 13-week period on October 1, 1981.

[9] The behavior of large banks under a surcharge depends crucially on the frequency criteria used in applying the surcharge. Thus, banks which do not see themselves as being seriously constrained by a surcharge may behave very differently from banks that are so constrained. Furthermore, frequency criteria may alter banks' decisions as to when to use the discount window, leading to unpredictable week-to-week changes in borrowing demand. These considerations highlight the complexity of modeling bank behavior when a surcharge is in effect.

when the funds rate is less than the basic discount rate plus the surcharge, large banks potentially subject to the surcharge will tend to avoid the discount window and will attempt to meet their reserve needs in the federal funds market. In contrast, when the federal funds rate exceeds the discount rate plus surcharge, large banks would be expected to return to the discount window, since the price of reserves borrowed from the Federal Reserve, including the surcharge, is less than the cost of federal funds.

Even though they are not subject to the surcharge, small banks are indirectly affected when a surcharge is in effect. To the extent that large banks avoid the discount window and attempt to fund their reserve needs in the market, they place upward pressure on the federal funds rate. Small banks which borrow reserves are affected in two ways. First, if small banks choose not to borrow at the discount window, they must pay the higher market rate. Second, small banks actually have an incentive to make more use of the discount window since a higher market rate increases the attractiveness of reserves borrowed at the basic discount rate. Indeed, given a fixed supply of borrowed reserves in a particular week, to the extent that the surcharge induces large banks to reduce their borrowings, the higher market rate will cause small banks to borrow an offsetting amount, leaving the total amount of discount window borrowings unchanged.

The Surcharge and the Demand for Borrowing

The impact of the discount rate surcharge on the demand for borrowing can be analyzed by dividing the total demand for borrowed reserves into the demands for borrowed reserves by large banks and small banks, respectively.

$$(3a)\quad BR_L^D = \overline{BR}_L + b_L(rF - rD - S)$$

$$(3b)\quad BR_S^D = \overline{BR}_S + b_S(rF - rD)$$

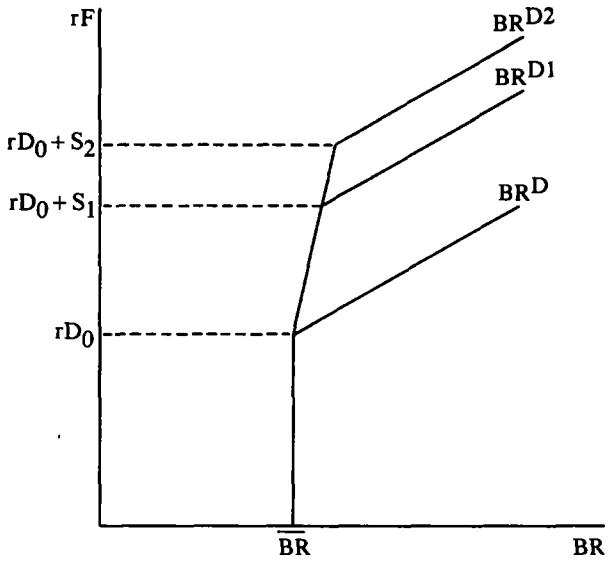
Equation (3a) describes the demand for borrowing by large banks subject to the surcharge.[10] Borrowing by large banks is made up of an interest-insensitive amount, $\overline{BR}_L$, plus an amount which depends upon the spread between the funds rate, rF, and the basic discount rate, rD, plus the surcharge rate, S. When the funds rate is below the basic discount rate plus surcharge, large banks are assumed to undertake only interest-insensitive borrowing.

Equation (3b) describes the demand for borrowing by small banks. Borrowing by small banks is made up of an interest-insensitive amount, $\overline{BR}_S$, plus an amount that depends upon the spread between the basic discount rate and the funds rate. Small banks are not directly affected by the surcharge rate.

The impact of the introduction of a surcharge on the total demand for borrowed reserves is shown in Figure 5. In the absence of a surcharge, the total demand for borrowed reserves, BR^D, is the sum of the separate demands by large and small banks. The introduction of a surcharge on large banks causes a change in their behavior. With a surcharge, S_1, when the funds rate is between the basic rate, rD_0, and the basic rate plus surcharge, $rD_0 + S_1$, there is no interest-sensitive borrowing by large banks. The total demand for bor-

[10] In order to simplify the analysis in light of the problem of modeling the impact of frequency criteria on surcharge borrowing, it is assumed that all large banks are subject to the surcharge in a given week. To the extent that all large banks are not subject to the surcharge, the interest rate implications of the surcharge are attenuated. Furthermore, frequency criteria may cause the demand for borrowed reserves by large banks to undergo considerable week-to-week variations.

Figure 5



rowing consists of the interest-insensitive borrowing by both large and small banks plus the interest-sensitive borrowing by small banks. When the funds rate rises above the basic discount rate plus surcharge, rD_0+S_1, interest-sensitive borrowing by large banks is restored. Thus, with a surcharge, S_1, the total demand for borrowed reserves is shown as the curve BR^{D1}.[11] With a larger surcharge, S_2, the demand for borrowed reserves is given by BR^{D2}. That is, the higher the surcharge, the greater the range over which large banks tend to avoid the discount window.

[11] Without a surcharge, the total demand for borrowed reserves is given by:

$$BR^D = \overline{BR}_L + \overline{BR}_S + (b_L + b_S)(rF - rD).$$

With a surcharge and with the funds rate below the discount rate plus surcharge, the total demand for borrowed reserves is given by:

$$BR^D = \overline{BR}_L + \overline{BR}_S + b_S(rF - rD).$$

With a surcharge and with the funds rate above the discount rate plus surcharge, the total demand for borrowed reserves is given by:

$$BR^D = \overline{BR}_L + \overline{BR}_S + b_L(rF - rD - S) + b_S(rF - rD).$$

Thus, the steeper slope of the borrowing demand curve, BR^{D1}, in Figure 5 when the funds rate is between the basic discount rate and the basic rate plus surcharge corresponds to the second case where only small banks have interest-sensitive borrowing.

The Surcharge and Interest Rates

The discount rate surcharge has a number of important implications for the level of market interest rates. The main points are summarized first and are then discussed in more detail below.

1. For a given supply of borrowed reserves, a discount rate surcharge raises market interest rates as compared to a situation of no surcharge. Moreover, a surcharge can affect market interest rates even if no borrowing occurs at the surcharge rate.

2. The impact on market rates of a given surcharge is not uniform but depends upon the quantity of borrowed reserves supplied. In general, a surcharge of a given amount has a larger impact on market rates at higher levels of borrowing.

3. The imposition of a surcharge has a smaller impact on market rates than an equal increase in the basic discount rate.

4. Changes in the surcharge rate may or may not have an impact on market rates depending on the position of the market rate relative to the surcharge.

Generally speaking, a discount rate surcharge affects market interest rates by changing the relative cost of funds obtained via the discount window versus funds obtained in the market. Suppose that the funds rate is between the basic discount rate and the discount rate plus surcharge. In this situation, large banks subject to the surcharge have an incentive to reduce their discount window borrowing and to increase their borrowing in the funds market. These actions cause the funds rate to be bid up relative to the basic discount rate. Small banks, initially unaffected by the imposition of the surcharge,

Figure 6

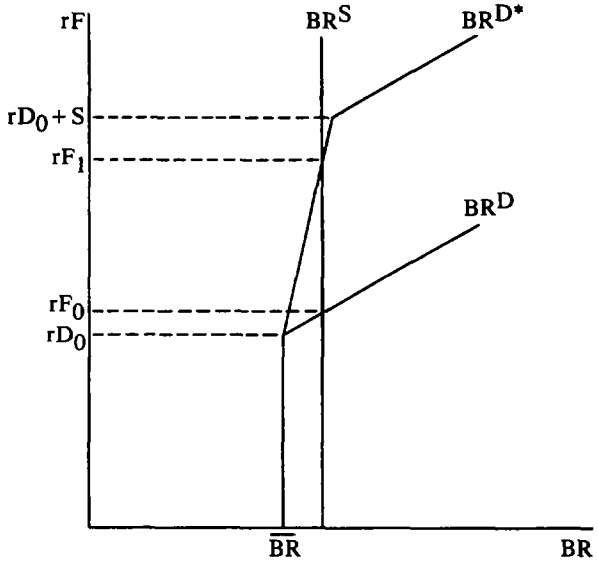
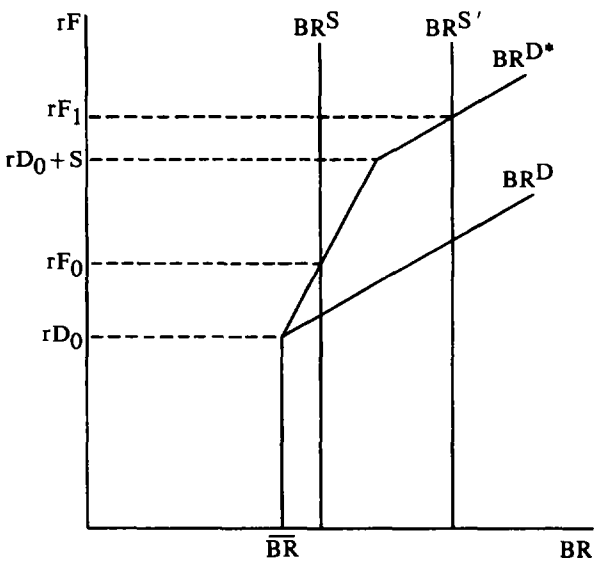


Figure 7



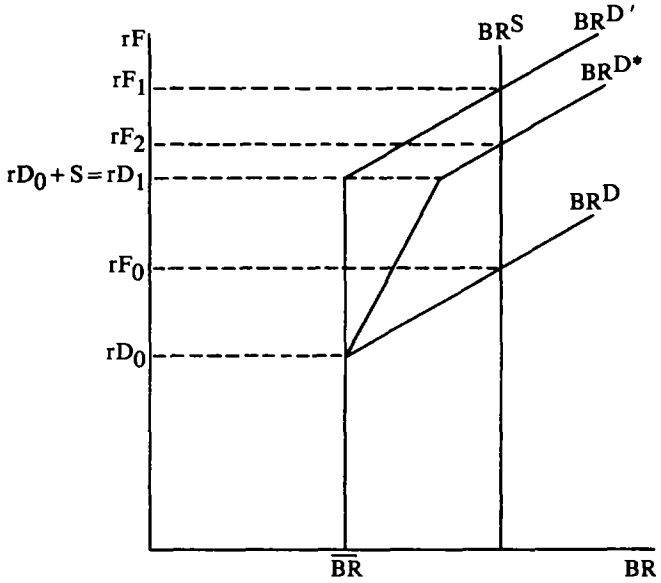
tend to increase their discount window borrowing in response to the widening spread between the funds rate and the basic discount rate. It is important to note that the increase in the funds rate occurs in response to large banks' attempts to avoid paying the surcharge. Thus, the rise in the funds rate can occur even if no large banks actually borrow at the surcharge rate.

These points are illustrated in Figure 6. In the absence of a surcharge, the demand for borrowed reserves is given by BR^D. With the supply of borrowed reserves, BR^S, the initial funds rate, rF_0, is above the basic discount rate, rD_0. In this situation, some interest-sensitive borrowing by both large and small banks would occur. With a surcharge, however, the demand for borrowed reserves is given by BR^{D*}, and the funds rate rises from rF_0 to rF_1 in order to induce small banks to absorb the borrowed reserves that are no longer demanded by large banks subject to the surcharge. Moreover, since the funds rate is between the discount rate and the discount rate plus surcharge, there would be no interest-sensitive borrowing by large banks.

While a surcharge tends to raise market interest rates, the size of the impact on market rates varies with the level of borrowing. In general, a given surcharge has a larger effect at higher levels of borrowing. The reason is that for a relatively small supply of borrowed reserves, the funds rate does not have to rise by much in order to induce small banks to offset the reduction in borrowing by large banks caused by the surcharge. In contrast, with a relatively large supply of borrowed reserves, the funds rate has to rise by a greater amount in order for banks to borrow the quantity supplied. In fact, the funds rate may rise above the basic discount rate plus surcharge, giving both large banks and small banks an incentive to use the discount window.

Figure 7 shows how the impact of a surcharge on interest rates may vary depending on the level of borrowing. With a surcharge of a given amount, S, the demand for borrowed reserves is given by BR^{D*}. If the supply of borrowed

Figure 8



reserves is BR^S, the equilibrium funds rate is rF_0. Since the funds rate is between the basic discount rate, rD_0, and the basic rate plus surcharge, $rD_0 + S$, all interest-sensitive borrowing is done by small banks. In contrast, with borrowing supply curve $BR^{S'}$, the funds rate, rF_1, is above the basic rate plus surcharge, $rD_0 + S$, so that both large and small banks borrow at the discount window. Comparison of the two cases shows that the surcharge has a larger impact on the spread between the funds rate and basic discount rate for higher levels of borrowing.

A third property of a discount rate surcharge is that a surcharge has a smaller impact on market rates than an equal change in the basic discount rate. That is, a 1 percent surcharge has less of an impact on market rates than a 1 percent increase in the basic rate. Moreover, since an increase in the basic rate generally raises market rates on a one-for-one basis, a discount rate surcharge increases market rates by only a fraction of the surcharge.

The reason for this difference is that a change in the basic discount rate makes the discount window less attractive to both large banks and small banks. In contrast, a discount rate surcharge directly alters the behavior only of large banks subject to the surcharge. Thus, for an equal increase in the two rates, the demand for borrowed reserves is reduced by a greater amount in the case of the basic rate. As a consequence, the market rate must rise by more in the case of a change in the basic rate to induce banks to return to the discount window and absorb the fixed supply of borrowed reserves.

A comparison of changes in the basic discount rate and the discount rate surcharge is shown in Figure 8. Initially, for a basic discount rate of rD_0, the demand for borrowed reserves is given by BR^D. With a fixed supply of borrowed reserves, BR^S, the initial funds rate is rF_0. A 1 percent increase in the basic discount rate causes a reduction in the demand for borrowed reserves by both large and small banks so that the BR^D curve shifts to $BR^{D'}$ and the funds rate increases to rF_1. In contrast, a 1 percent discount rate surcharge leads to a reduction in the demand for borrowed reserves by large banks only. In this situation, the borrowing demand curve shifts from BR^D to BR^{D*} and the funds rate rises to rF_2. Thus, an increase in the basic discount rate results in a larger increase in the funds rate than does an equal increase in the surcharge.

While a discount rate surcharge generally has an impact on market interest rates, there are important circumstances in which changes in the surcharge may not affect market rates. Specifically, a discount rate surcharge only affects market rates to the extent that it alters the behavior of banks subject to the surcharge. Thus, for example, if a surcharge is in effect and the funds rate is currently lower than the basic discount rate plus surcharge, large banks do not have an incentive to use the discount

Table 1
DISCOUNT RATE HISTORY: POST OCTOBER 1979

Date*	Basic Rate (in percent)	Surcharge (in percent)
1980		
February 15	13	—
March 17	—	3
May 8	—	0
May 30	12	—
June 13	11	—
July 28	10	—
September 26	11	—
November 17	12	2
December 5	13	3
1981		
May 5	14	4
September 22	—	3
October 12	—	2
November 2	13	—
November 17	—	0
December 4	12	—
1982		
July 20	11½	—
August 2	11	—
August 16	10½	—
August 27	10	—

*Effective date of rate changes at the Federal Reserve Bank of New York. NOTE: The discount rate was 12 percent at the time of the October 1979 operating procedure switch.

window. In this situation, an increase in the surcharge would not be expected to have an impact on market rates, since it would not induce any further reduction in discount window usage by large banks.

In a similar manner, a reduction in a discount rate surcharge may not affect market interest rates. To be effective in reducing market rates, a cut in the surcharge would have to be large enough so that large banks would have an incentive to return to the discount window. That is, under circumstances in which large banks are avoiding the discount window because of the presence of a surcharge, a cut in the surcharge would have to be large enough to place the basic discount rate plus surcharge below the funds rate. Only then would large banks have an incentive to return to the discount window.

EMPIRICAL ANALYSIS

This section contains a variety of empirical evidence on the role of the basic discount rate and the discount rate surcharge in the period since October 1979. The analysis is divided into two parts. In the first part, the effects of changes in the basic discount rate and the discount surcharge on market interest rates are examined. The second part contains a more detailed discussion of the impact of the surcharge on the behavior of large banks and on the demand for borrowed reserves.

The Impact of Discount Rate Changes

A history of recent changes in the basic discount rate and discount rate surcharge is shown in Table 1. In the post-October 1979 period the basic rate has been changed 14 times and has ranged from 10 to 14 percent. A 3 percent surcharge was imposed in March 1980 and removed in May 1980. The surcharge was reimposed in November 1980 at a rate of 2 percent and was subsequently raised to 3 percent in December 1980 and to 4 percent in May 1981. The surcharge was then lowered to 3 percent in September 1981, to 2 percent in October 1981, and was removed in November 1981.

The previous analysis suggests that both the basic discount rate and the discount rate surcharge can have a significant impact on market interest rates when the Federal Reserve employs a nonborrowed reserve operating procedure. In order to measure these effects, a simple weekly model of the reserves market was estimated over the period from October 1979 to May 1982. The model, shown in Table 2, is a reduced form of the model of the demand and

Table 2
THE IMPACT OF DISCOUNT RATE CHANGES

I. Model

$$\Delta rF = a_0 + a_1 \cdot D1 \cdot \Delta rD + a_2 \cdot D2 \cdot \Delta rD + a_3 \cdot \Delta S + a_4 \cdot \Delta NBR + a_5 \cdot \Delta RR + a_6 \cdot \Delta NETCO$$

where

rF	= federal funds rate
rD	= basic discount rate
D1	= dummy variable for discount rate increases (=1 for increases, =0 otherwise)
D2	= dummy variable for discount rate decreases (=1 for decreases, =0 otherwise)
S	= discount rate surcharge
NBR	= nonborrowed reserves
RR	= required reserves
NETCO	= potential net carryover of excess reserves

II. Estimation

$$\Delta rF = \underset{(-0.1766)}{-0.0119} + \underset{(2.3405)}{1.1598 \cdot D1 \cdot \Delta rD} + \underset{(0.3385)}{0.1629 \cdot D2 \cdot \Delta rD}$$

$$+ \underset{(3.8445)}{0.6452 \cdot \Delta S} - \underset{(-2.5326)}{0.0003 \cdot \Delta NBR} + \underset{(2.3678)}{0.0006 \cdot \Delta RR} - \underset{(-2.9673)}{0.0016 \cdot \Delta NETCO}$$

Sample period: weekly, October 17, 1979 to May 5, 1982

$\bar{R}^2 = .2240$ Standard Error of Regression = 0.7476

Durbin-Watson Statistic = 1.84

NOTE: The federal funds rate, the basic discount rate, and the surcharge rate are measured in percentage points and are based on seven-day averages for the statement week ending Wednesday. Nonborrowed reserves, required reserves, and potential net carryover of excess reserves are measured in millions of dollars.

supply of borrowed reserves presented earlier. In this reduced form, changes in the federal funds rate, rF, are related to changes in the basic discount rate, rD, changes in the discount rate surcharge, S, changes in nonborrowed reserves, NBR, changes in required reserves, RR, and changes in the net carryover of excess reserves, NETCO.[12]

The theoretical analysis suggests that the impact of discount rate changes differs according

12 Under present reserve accounting procedures, depository institutions are allowed to carry forward into the following settlement period excess reserves or a reserve deficiency of up to 2 percent of reserve requirements. Thus, this carryover provision affects the net supply of borrowed reserves in a given week.

to whether the funds rate is above or below the basic discount rate. In fact, it is possible to distinguish four cases: (1) a basic discount rate increase without a penalty rate, (2) a discount rate increase with a penalty rate, (3) a discount rate decrease without a penalty rate, and (4) a discount rate decrease with a penalty rate. As a practical matter, however, 10 of the 11 discount rate changes during the sample period fell into categories (1) and (4). Thus, two dummy variables were created in order to distinguish the effects of increases versus decreases in the basic discount rate. The coefficient a_1 measures the impact on the funds rate of an increase in the basic rate. Because all basic discount rate increases during the sample period occurred in a nonpenalty rate setting, the coefficient a_1 would be expected to have a value close to one. In contrast, the coefficient a_2 measures the impact on the funds rate of a decrease in the basic discount rate. Since most cuts in the basic discount rate occurred in a penalty rate environment, a_2 would be expected to have a value close to zero.[13]

The empirical results in Table 2 strongly support the view that discount rate increases can have a significant effect on market rates under a nonborrowed reserves operating procedure. The value of the coefficient a_1 indicates that an increase in the basic discount rate by 1 percentage point leads to a rise in the funds rate of approximately 1.16 percentage points. Thus, increases in the basic discount rate have approximately a one-for-one effect in raising market rates in an environment of lagged reserve accounting and a nonborrowed reserve operating procedure.

In contrast, the coefficient on basic rate reductions, a_2, is small and not statistically different from zero. Thus, during the sample period, reduction in the basic discount rate had little or no independent effect on market rates. The explanation of this result is that most of the cuts in the basic rate occurred when the funds rate was below the discount rate. Under these circumstances, the previous analysis suggests that discount rate reductions do not have an impact on market rates.

The reaction of market rates to changes in the discount rate surcharge also is consistent with the theoretical discussion. The surcharge coefficient, a_3, is significant and indicates that a 1 percent surcharge raises the funds rate by approximately 65 basis points. That is, while changes in the surcharge affect market rates, these changes have a smaller impact than changes in the basic discount rate. Moreover, a surcharge of 3 percent increases market rates by approximately 2 percentage points, a result similar to that obtained in the Federal Reserve System study of the impact of the new operating procedures.[14]

Surcharge Borrowing and Interest Rates

While the empirical analysis confirms the importance of discount rate changes on market interest rates, a more detailed analysis is necessary to gauge the impact of the discount rate surcharge on the behavior of large banks and on the total demand for borrowed reserves. Some information can be obtained by dividing the sample period, October 1979-May 1982, into weeks in which a surcharge was in effect and weeks without a surcharge. This procedure shows that large banks' borrowing as a percent of total borrowing averaged 60 percent in weeks without a surcharge compared with an average

[13] It should be noted that over a sample period that contained more observations in categories (2) and (3), it might be useful to develop additional dummy variables. While in principle it might be possible to extend this type of categorization to surcharge changes, in practice collinearity between basic discount rate changes and surcharge changes prevented its application.

[14] P. Keir, p. A-6.

Table 3
SURCHARGE BORROWING

Surcharge Rate (percentage points)	Weeks in Effect	Amount Borrowed at the Surcharge ($ millions)		Number of Institutions Paying the Surcharge		Surcharge Borrowing as a Percent of Total Borrowing by Large Institutions		Surcharge Borrowing as a Percent of Total Borrowing	
		Mean	Range	Mean	Range	Mean	Range	Mean	Range
2	8	174	0-669	8	0-30	15	0-45	10	0-31
3	33	81	0-395	5	0-29	11	0-53	5	0-26
4	20	96	0-494	5	0-14	9	0-48	5	0-20

of 52 percent in weeks with a surcharge. Thus, there was a tendency for large banks to borrow relatively less and small banks to borrow relatively more in weeks in which a surcharge was in effect.

A more detailed picture of surcharge borrowing is provided in Table 3. These data indicate that, at times, surcharge borrowing comprised as much as 50 percent of the total borrowing of large banks and as much as 30 percent of total borrowing by all institutions. The table also provides evidence on the relationship between the size of the surcharge and the number of institutions borrowing at the surcharge rate. While as many as 30 institutions paid the surcharge in a given week in which a 2 or 3 percent surcharge was operative, this number was reduced by half in the presence of a 4 percent surcharge. Furthermore, regardless of the surcharge rate in effect, the amount of surcharge borrowing varied over a wide range, highlighting the difficulty of forecasting the demand for borrowing in weeks in which a surcharge was in effect.

The theoretical analysis presented earlier suggested that the behavior of large banks under a surcharge should depend on the relationship of the funds rate to the basic discount rate plus surcharge. In particular, when the funds rate is below the discount rate plus surcharge, one would expect relatively little usage of the discount window by large banks potentially subject to the surcharge. In contrast, with a funds rate above the discount rate plus surcharge, the discount window becomes a more attractive source of funds to large banks.

This analysis is supported by the data presented in Chart 1, which shows the amount of surcharge borrowing as a percent of total borrowing in weeks in which a surcharge was in effect. The blue bars indicate those weeks in which the funds rate is below the discount rate plus surcharge, while the black bars identify weeks in which the funds rate is above the discount rate plus surcharge. There is a clear tendency for the proportion of surcharge borrowing to increase in weeks in which the funds rate is above the basic discount rate plus surcharge. Thus, the proportion of surcharge borrowing to total borrowing appears to be related to the relative prices of reserves obtained in the market versus reserves obtained at the discount window.

The previous theoretical analysis suggests there are two important ways in which the surcharge affects the demand for borrowing. First, a surcharge tends to reduce the demand for borrowing at any given spread between the funds rate and the basic discount rate. This relationship is examined in Chart 2, which compares the spread to total borrowing. The black dots depict weeks in which no surcharge was in effect while the blue dots correspond to weeks in which a surcharge was in effect. In general, the

Chart 1
INTEREST SENSITIVITY OF SURCHARGE BORROWING

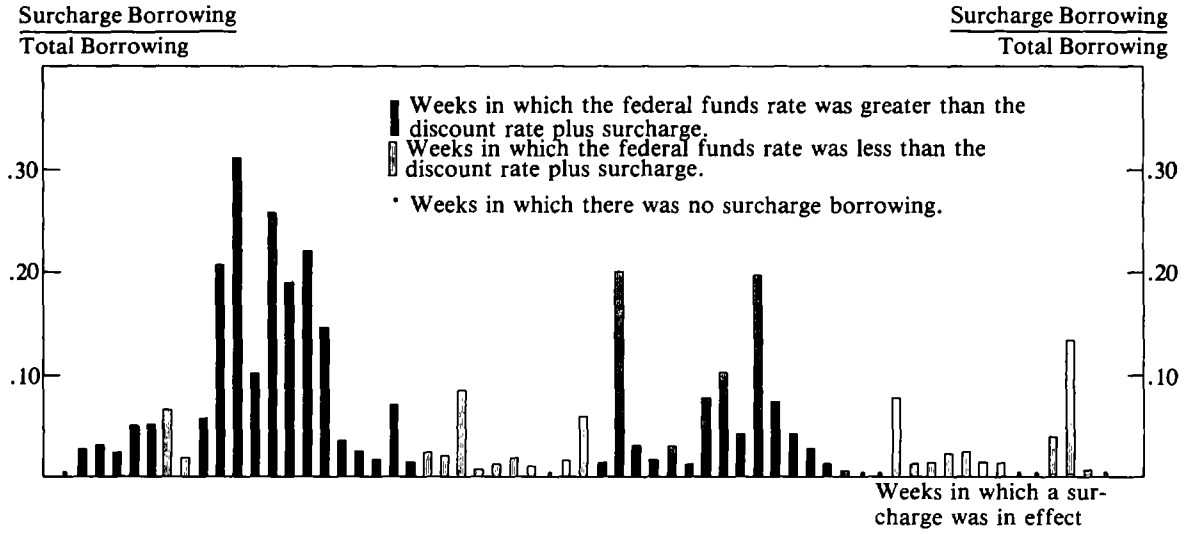


Table 4
SPREAD BETWEEN FEDERAL FUNDS RATE AND DISCOUNT RATE AT ALTERNATIVE BORROWING LEVELS

(Percentage Points)

Borrowing (millions of dollars)	No Surcharge	Surcharge = 2 Percent	Surcharge = 3 Percent	Surcharge = 4 Percent
1,000	1.04	1.61	2.00	2.49
1,500	1.71	2.65	3.29	4.09
2,000	2.44	3.77	4.69	5.83
2,500	3.21	4.96	6.17	7.67

Estimated Equation

$$\ln(\text{Spread}) = \underset{(-9.6728)}{-8.4576} + \underset{(6.7905)}{0.2178} \cdot S + \underset{(10.1316)}{1.2296} \cdot \ln(BR)$$

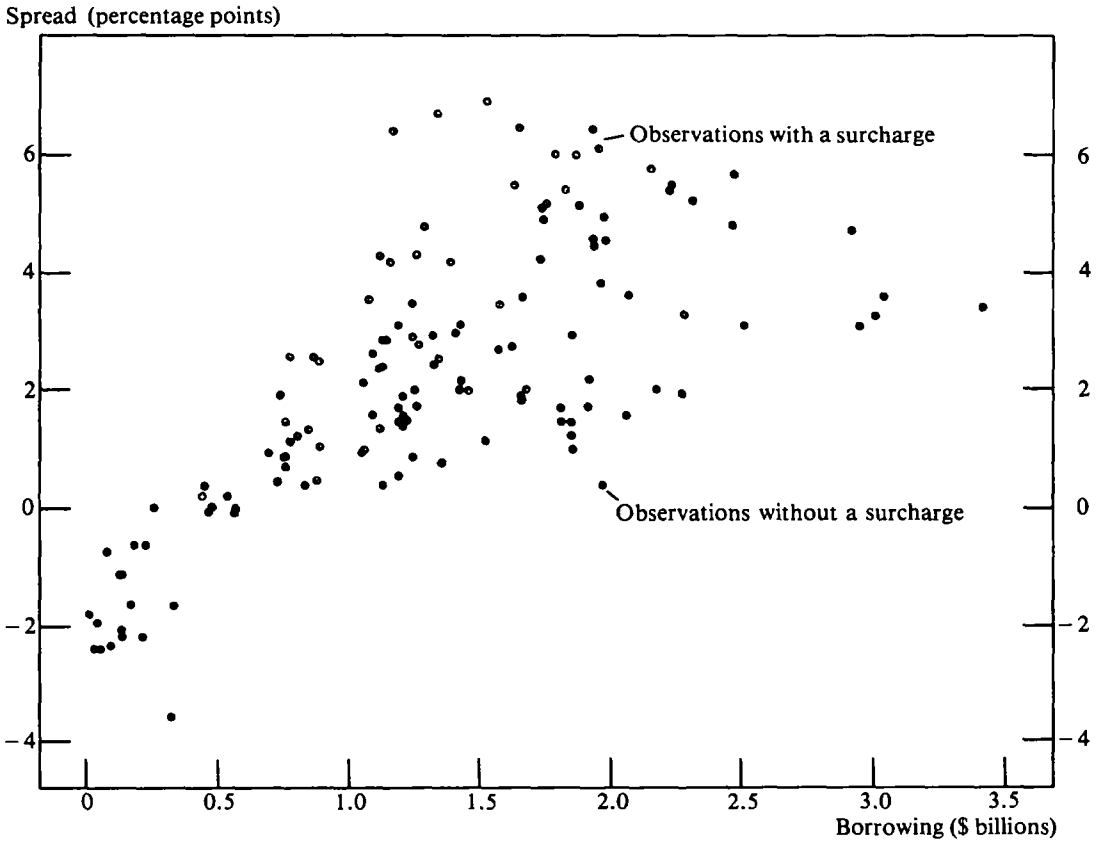
where

ln = natural logarithm
Spread = federal funds rate − basic discount rate
S = discount rate surcharge
BR = borrowed reserves

Sample period: weekly, October 17, 1979 to May 5, 1982
$\bar{R}^2$ = .5883 Standard Error of Regression = 0.5674
Durbin-Watson Statistic = 0.83

NOTE: The discount rate surcharge and the spread between the federal funds rate and the basic discount rate are measured in percentage points and are based on seven-day averages for the statement week ending Wednesday. Borrowed reserves are measured in millions of dollars.

Chart 2
BORROWING AND THE SPREAD BETWEEN THE FEDERAL FUNDS RATE AND THE BASIC DISCOUNT RATE: POST OCTOBER 1979



blue dots occur higher and to the left of the black dots. That is, the presence of a surcharge appears to reduce the demand for borrowing so that a higher spread is required to induce a given level of borrowing when a surcharge is in effect than when no surcharge is in effect.

Second, the surcharge does not uniformly affect the demand for borrowing. That is, at higher levels of borrowing, any given surcharge will have a greater impact on the spread than at lower levels of borrowing. This relationship, as well as the impact of the surcharge on the demand for borrowing discussed above, is clearly illustrated in Table 4. The information in this table was obtained from a simple log linear regression of the spread as a function of borrowing and the discount rate surcharge shown in Table 4.[15] For each surcharge rate, this equation was used to calculate the spread that would result at the indicated levels of borrowing. With this nonlinear borrowing function, the spread

[15] The sample period excluded weeks in which the spread between the funds rate and the basic discount rate was negative.

between the funds rate and the basic discount rate is 1.04 percentage points when borrowing is $1 billion but 2.44 percentage points when borrowing is $2 billion. The imposition of a 2 percent surcharge has the effect of raising the spread by 0.57 percentage points with borrowing at $1 billion. In contrast, the 2 percentage surcharge raises the initial spread by 1.33 percentage points at a borrowing level of $2 billion. Similarly, a 3 or 4 percent surcharge raises the spread at each level of borrowing, but an increasing amount at higher levels of borrowing. Thus, while the discount rate surcharge generally reduces the demand for borrowing, its impact increases with the size of the surcharge and with the level of borrowing.

SUMMARY AND CONCLUSIONS

This article has examined the short-run implications of the basic discount rate and discount rate surcharge for market interest rates and discount window borrowing under reserve targeting. The analysis shows that when the basic discount rate is not a penalty rate, changes in the basic rate have a one-for-one impact on market rates but no immediate effect on discount window borrowing. In contrast, with a penalty discount rate, discount rate changes have no direct impact on interest rates or borrowing.

The analysis of the discount rate surcharge is more complex. While the surcharge may not immediately affect the total amount of discount window borrowing, it tends to reduce the proportion of borrowing done by large banks and to increase the proportion done by small banks. Moreover, while a surcharge generally raises market rates by an amount less than an equal increase in the basic rate, its impact is variable and difficult to predict. In general, the effect of the surcharge depends both on the factors determining which large banks are subject to the surcharge and on the level of borrowing that must be done by all institutions. Finally, changes in the surcharge may or may not have an impact on market rates depending on the relationship of market rates to the cost of funds at the discount window.

The empirical evidence presented generally supports the theoretical analysis. In the period since the adoption of reserve targeting, increases in the basic discount rate have generally had a one-for-one effect on market rates. In contrast, reductions in the basic rate have had little influence on market rates. On average, the discount rate surcharge also appears to have had a significant effect on market rates. However, the impact of the surcharge on large bank behavior and on the demand for borrowing seems to have been quite variable.

Seasonal Borrowing Privilege: Profile of the Tenth Federal Reserve District

By John E. Yorke and Charlotte Herman

The seasonal borrowing privilege (SBP) was introduced by the Federal Reserve System in 1973. It was established to provide depository institutions that lack reliable access to money market sources of funds Federal Reserve credit for seasonal funding needs. The intent of the SBP was to assist member banks to better serve the credit needs of their communities by enabling them to expand their loan portfolios throughout the year. The SBP has been of particular significance to the Tenth Federal Reserve District because of the large percentage of banks therein that experience seasonal fluctuation in loans and deposits.[1]

This study briefly reviews the history of the SBP and the use of seasonal credit by Tenth District member banks between 1974 and 1980. It also examines the characteristics of Tenth District eligible and borrowing banks during that period to determine the extent to which the profile of Tenth District seasonal borrowers conforms to the profile envisioned by the Federal Reserve when the program was established. Finally, the study examines the liquidity positions of Tenth District small banks in an attempt to explain their relatively low participation in the SBP.

BACKGROUND: ADMINISTRATION OF THE SBP

Since its foundation in 1913 the Federal Reserve has been authorized to make loans to banks. The primary purpose of this authority is to provide the banking system with an ultimate source of liquidity. As an ultimate liquidity source, Federal Reserve credit is primarily used to assist banks in meeting short-term adjustment needs arising from unanticipated changes in assets or liabilities.

Prior to 1973 it was not considered appropriate for a bank to use Federal Reserve credit to meet a seasonal need that could be reasonably met through its own resources. The decreasing liquidity of banks in the 1960s led to a reassessment of that position. As a part of the reappraisal of the discount window, a study was conducted by Emanuel Melichar of intra-year fund flows at commercial banks. This

[1] The Tenth District includes Kansas, Nebraska, Wyoming, Colorado, the western one-third of Missouri, northern New Mexico, and most of Oklahoma.

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study showed that a significant proportion of banks had large seasonal funding needs.[2] Moreover, many of these banks had limited access to financial markets. Loan and deposit volumes at the smaller, rural banks showed greater relative intra-year changes because of the high dependence of the banks and their communities on single industries that had seasonal needs for funds. The study determined that by providing a small amount of credit relative to deposit size, the Federal Reserve could assist banks in meeting seasonal needs for funds.

Thus, the Federal Reserve System established the SBP through an amendment to its Regulation A on April 19, 1973. The announced purpose of the SBP was to "assist a member bank that lacks reasonably reliable access to national money markets in meeting seasonal needs for funds arising from a combination of expected patterns of movement in its deposits and loans."[3]

To determine whether banks in their districts are likely to demonstrate recurring seasonal patterns in fund flows, most Reserve banks use the X-11 variant of the Census Method II seasonal adjustment program. Using historical deposit and loan data, this program estimates the seasonal pattern of deposits and loans and projects this pattern for the year ahead. An institution's projected difference between deposits and loans—i.e., its net fund availability, is the basis for its estimated seasonal need. The program determines in which month the bank will exhibit the highest degree of liquidity (as measured by the difference between deposits and loans). It then subtracts the projected net fund availability in each of the remaining 11 months from this peak to compute the seasonal need for each month. Because a participant in the program is expected to meet a portion of its seasonal need from its own liquidity reserves, the seasonal borrowing qualification is less than the measured seasonal need. The qualification equals the seasonal need less a certain "deductible," which is an amount equal to a proportion of the institution's average deposits over the previous year. When the program was introduced in 1973, the deductible was pegged at 5 percent of average deposits, regardless of bank size.

The concept of "reasonably reliable" access to market sources of funds was not strictly defined in the original guidelines for administration of the SBP. The guidelines emphasized that access is relative. Banks with deposits under $100 million were presumed to lack access. The eligibility of a larger bank was an administrative decision based upon evidence that the bank could not readily tap market sources of funds.[4]

Differences among Reserve banks in making the access determination were partially responsible for changes in administration of the SBP, which were effective August 25, 1976. In its deliberations prior to the amendments, the Board's staff recognized that banks with deposits of $100 to $500 million had difficulties in gaining credit accommodation from correspondent banks in times of monetary stringency. Thus, the revised SBP raised the deposit size of eligible banks to $500 million and replaced the constant 5 percent deductible

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2 Emanuel Melichar, "Toward a Seasonal Borrowing Privilege: A Study of Intra-year Fund Flows at Commercial Banks" in *Reappraisal of the Federal Reserve Discount Mechanism*, Board of Governors of the Federal Reserve System, August 1971, Volume 2, p. 95.

3 *Extensions of Credit by Federal Reserve Bank—Regulation A*, 12 C.F.R. 201, April 19, 1973, Section 201.2(d).

4 The guidelines stated that it would be uncommon for a bank with average deposits of more than $250 million to lack the ability to obtain money market sources of funds to meet seasonal liquidity pressures. All applicants had to demonstrate a seasonal qualification with a minimum duration of eight weeks. Prearrangement to the extent possible was encouraged, and net sales of federal funds were discouraged while seasonal credit was outstanding.

Table 1
SYSTEM AND TENTH DISTRICT SEASONAL BORROWING: 1974-80

	System Daily Average Borrowings (In thousands of dollars)			Tenth District Daily Average Borrowings (In thousands of dollars)			Tenth District as a Percent of System Borrowings	
Year	Total	Seasonal	Seasonal as Percent of Total	Total	Seasonal	Seasonal as Percent of Total	Percent of Total	Percent of Seasonal
1973*	1,684,200	95,004	5.6	114,196	28,621	25.1	6.8	30.1
1974	2,048,231	86,115	4.2	84,375	18,481	21.9	4.1	21.5
1975	201,698	23,340	11.6	6,082	3,403	56.0	3.0	14.6
1976	84,692	18,192	21.5	8,216	4,469	54.4	9.7	24.6
1977	463,769	55,250	11.9	38,566	19,574	50.8	8.3	35.4
1978	867,846	120,423	13.9	58,234	25,213	43.3	6.7	20.9
1979	1,332,846	145,538	10.9	89,909	32,483	36.1	6.7	22.3
1980	1,414,918	72,491	5.1	67,579	19,993	29.6	4.8	27.6

*For 1973, the seasonal privilege was available for only 9 1/2 months.
Source: Board of Governors of the Federal Reserve System, Federal Reserve Bank of Kansas City.

with a graduated scale of 4 to 10 percent, which varied directly with bank size. The Board expected that the requirement for larger banks to meet a greater proportion of their seasonal needs from internal sources would eliminate those banks with assured access to the national money markets from participation in the program.[5] To foster greater use of the SBP by member banks, the Board reduced the minimum period of seasonal need from eight to four weeks and abolished the prohibition on net sales of federal funds by seasonal borrowers.

USE OF THE SEASONAL BORROWING PRIVILEGE

Since the establishment of the SBP, seasonal credit has represented only a small part of total lending by the Federal Reserve. (See Table 1.) For 1974 (the first full year of the SBP) through 1980, seasonal credit accounted, on average, for 13 percent of total System lending. It ranged from a low of 4.2 percent in 1974 to a high of 21.5 percent in 1976. The amount of seasonal

[5] A recent study conducted in the Ninth Federal Reserve District (Minneapolis) by Stanley L. Graham has questioned the continued relevance of the SBP in light of the nationwide development of the federal funds market and the greater use of seasonal credit by multibank holding company affiliates in that District. Both phenomena, according to Graham, indicate that seasonal borrowers have access to market sources of funds and, therefore, should not rely on Federal Reserve credit to meet seasonal funding needs. Graham attributes historical changes in the level of seasonal borrowings to changes in the discount rate relative to the federal funds rate. As the differential rises, borrowings tend to rise; when the differential decreases, the level of seasonal credit outstanding tends to fall. See Stanley L. Graham, "Is the Fed's Seasonal Borrowing Privilege Justified?" Federal Reserve Bank of Minneapolis *Quarterly Review*, Volume 66, No. 4, Fall 1979, p. 9.

Melichar has attributed historical declines in seasonal borrowings to easing liquidity positions of correspondent banks. These periods of slack have tended to coincide with federal funds rates at levels below the discount rate. Melichar has stated that a true "macro" test of access would be the observation of changes in seasonal borrowing levels in a period of tight monetary policy in which the discount rate would be pegged above the federal funds rate. He notes that these conditions have not appeared to date. See Emanuel Melichar, "The Federal Reserve Seasonal Borrowing Privilege," *Future Sources of Loanable Funds for Agricultural Banks*, a symposium sponsored by the Federal Reserve Bank of Kansas City (Kansas City, Missouri), December 8-9, 1980, pp. 111-32.

credit extended has been considerably less than the originally estimated potential. From 1973 through 1980, total potential seasonal borrowing had been projected to be about $600 million on an annual average basis.[6] The average annual amount of seasonal credit extended over that period, however, was only $77 million.

For the first two years of its existence, 1973 and 1974, borrowing under the SBP was high compared with the volume of credit extended in later years. Seasonal borrowing dropped off dramatically the next two years to the lowest levels in the history of the program. Although some authors have attempted to explain this drop on such factors as a reduction in the seasonality of funds flow and the program's restrictions on net sellers of federal funds, it may also have been the result of lower interest rates and easier credit conditions.[7]

For most of 1975 and 1976 the federal funds rate was lower than the discount rate. Under these conditions, a drop in all Federal Reserve borrowings, including credit under the SBP program, might be expected. It is worth noting, however, that during this interval seasonal credit as a percentage of total Federal Reserve credit increased significantly, from 4.2 percent in 1974 to 11.6 percent in 1975 and 21.5 percent in 1976.

For 1977 through 1979, the amount of seasonal credit increased. However, the percentage of seasonal to total credit declined. For 1980 both the amount of seasonal credit and seasonal credit as a percentage of total credit was less than for the previous two years. Economic conditions had an impact on seasonal activity that year. As in 1975 and 1976, federal funds rates were less than the discount rate for part of 1980.

The importance of the SBP to Tenth District banks is clearly illustrated in Table 1. For 1974 through 1980, seasonal credit represented an average of 42 percent of total lending to Tenth District banks. During those years, on average, 24 percent of total System seasonal credit was extended by the Federal Reserve Bank of Kansas City. The relatively large contribution of the Tenth District to seasonal credit totals reflects the large number of Tenth District banks that are eligible to use the SBP. The number of banks eligible to borrow seasonal credit, expressed as a percentage of all member banks in the District, has generally been 50 percent or more. However, a much smaller proportion, on average less than one-half of those eligible to borrow, actually made use of the SBP in the seven-year interval.

TENTH DISTRICT PROFILE OF ELIGIBLE AND BORROWING BANKS

This section analyzes the characteristics of the size, location, and agricultural orientation of Tenth District eligible and borrowing banks from 1974 through 1980. The purpose of the analysis is to assess the extent to which the banks' profile matched that expected by the framers of the SBP.

Since the studies conducted by Melichar in the mid-1960s revealed that rural banks exhibited a greater seasonal funding need than other banks, one would expect to see more small, rural, farm lending banks within the ranks of those institutions eligible to use the SBP.[8] This has been the case in the Tenth District. In general, a greater proportion of the smallest banks in the District, those with

[6] Ibid., p. 116.

[7] Ibid., p. 112.

[8] See Emanuel Melichar and Raymond J. Doll, "Capital and Credit Requirements of Agriculture and Proposals to Increase Availability of Bank Credit" in *Reappraisal of the Federal Reserve Discount Mechanism,* Board of Governors of the Federal Reserve System, Volume 2, p. 162.

deposits under $50 million, were eligible for the SBP than larger banks. Between 1974 and 1980, small banks comprised 83.5 percent of all Tenth District member banks but accounted for 90 percent of the total number of qualifying banks. Moreover, the largest percentage of banks eligible to use the SBP were in rural, or non-SMSA, areas. While 71 percent of all member banks were in rural areas, these banks constituted 79 percent of banks eligible to obtain seasonal credit. Finally, member banks with higher concentrations of farm loans in their portfolios were more likely to be eligible to participate in the SBP. Banks with agricultural loans equal to more than 40 percent of total loans outstanding represented only 35 percent of all District member banks. However, these banks accounted for half of all Tenth District eligible banks throughout the 1974-80 period.

Although banks eligible for seasonal credit exhibited the expected characteristics, one would not necessarily expect any correlation between these characteristics and use of the SBP by eligible banks. That is, once determined to be eligible for the SBP, a bank's location, agricultural orientation, and size should not—in and of themselves—explain its use of the SBP. Tenth District experience with the SBP supports this expectation with one exception—bank size. There was no significant difference between rural and urban bank use of the SBP. From 1974 through 1980, 20.9 percent of the eligible SMSA banks used seasonal credit, about one percentage point more than eligible banks outside SMSAs.

In addition, the extent of agricultural lending in Tenth District banks did not significantly influence decisions to use seasonal credit. Table 2 shows that approximately the same proportion, 20 percent, of eligible banks with a heavy agricultural orientation used seasonal credit as banks with a lower proportion of agricultural loans in their portfolios. For the purpose of this study, agriculturally oriented banks were defined as those with agricultural to total loans ratios of 40 percent or more.[9]

Table 2
CHARACTERISTICS OF TENTH DISTRICT SEASONAL CREDIT ELIGIBLE AND BORROWING BANKS: 1974-80

	Distribution of all Eligible Banks	Percentage of Eligible Banks Using the SBP
Location		
SMSA	21.5	20.9
Non-SMSA	78.5	19.9
Agricultural Orientation		
Ag Loans ≤ 40% of Total Loans	51.4	20.4
Ag Loans ≥ 40% of Total Loans	48.6	20.8
Multibank Holding Company Affiliation		
Affiliates	13.5	21.9
Nonaffiliates	86.5	19.6
Size		
$0 to $49 Million	90.5	18.6
≥ $50 Million	9.5	31.8

[9] Also, structural characteristics do not appear to have had significant influence over the use of the seasonal borrowing privilege by Tenth District banks. Of the banks that were subsidiaries of multibank holding companies and eligible to use seasonal credit, 22 percent on average did so from 1974 through 1980, compared with 20 percent of the eligible banks that were not subsidiaries of multibank holding companies. The lack of any significant correlation between use of the seasonal borrowing privilege and bank structure (multibank holding company banks as compared with independent banks) in the Tenth Federal Reserve District is consistent with the experience of the Federal Reserve

Unlike other factors, there has been a correlation between Tenth District bank size and use of the SBP. As seen in Table 2, bank size has been directly correlated with use of the SBP. On average, 32 percent of the eligible banks with deposits of $50 million or more borrowed seasonal credit. By contrast, only 19 percent of the small eligible banks used the SBP.

BANK SIZE AND THE DECISION TO BORROW SEASONAL CREDIT

An understanding of the lower participation by smaller banks requires an analysis of the mechanisms by which managers of small banks adjusted to liquidity pressures created by falling deposit levels or rising loan demand. Four different responses of managers could account for the absence of small eligible banks from the discount window. These include the liquidation by nonborrowers of a greater volume of securities, significantly higher reductions in their volume of federal funds sales, greater purchases of federal funds by nonborrowers, and the curtailment of loan activity.

An analysis of security holdings reveals no significant differences between the investment policies of small borrowing and nonborrowing banks. The ratio of investments to assets for small nonborrowers over the 1974-80 period averaged 28 percent, or about one percentage point more than that of small banks which used the SBP.

Similar findings appear when the level of federal funds purchased by the two groups are examined. In fact, neither borrowers nor nonborrowers participated significantly in the federal funds market between 1974 and 1980. Federal funds purchased, expressed as a percentage of deposits and purchased funds, averaged .5 percent for small nonborrowers and 1.3 percent for small borrowers.

On the other hand, small nonborrowers sold significantly more federal funds than small banks that used the SBP. Federal funds sold by nonborrowers averaged 7.9 percent of deposits and funds sold. This was about twice the average recorded by small borrowing banks.

Given the lack of significant differences between small nonborrowers and borrowers in security holdings and purchased funds practices, the persistence of higher levels of federal funds sales by nonborrowers might indicate that they maintained greater levels of "excess liquidity" throughout the year to meet seasonal liquidity needs compared to small SBP users. If this were the case, one might expect small seasonal borrowers to exhibit higher average loan to deposit ratios. Indeed, the annual loan to deposit ratios of small borrowers was consistently higher than that of small nonborrowers throughout the 1974-80 period. This ratio averaged 70.8 percent for small borrowers but only 63.4 percent for nonborrowers.

The relative degree of liquidity strain, or adjustment required within the year to meet changes in deposit and loan levels, could also explain why more small eligible banks did not use their seasonal credit qualification. One indicator of liquidity strain, deposits minus loans, was constructed to measure the magnitude of change in eligible banks' net fund availability.[10] As illustrated by Chart 1, Tenth

System in general (op. cit., Melichar, p. 119). An exception was the experience in the Ninth Federal Reserve District, where banks affiliated with multibank holding companies tended to use the seasonal borrowing privilege substantially more than independent banks (op. cit., Graham, pp. 9-14).

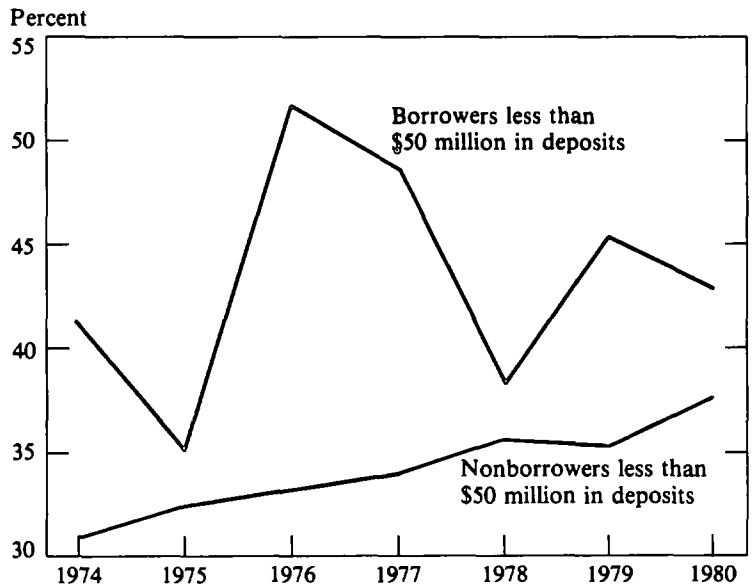
[10] For each year in the interval weekly deposit and loan data were averaged, giving monthly figures. Average loans were then deducted from average deposits. The lowest monthly net fund availability average was then subtracted from the peak monthly net fund availability total and expressed as a percentage of the peak amount. A higher variance in net fund availability might imply a more onerous task of adjusting to deposit outflow or increases in loan demand.

District data indicate that the net fund availability variance ratios of small borrowers were higher than those of their nonborrowing counterparts by a large margin. Throughout the 1974-80 period, the variance ratios for small borrowers averaged 43.4 percent; in contrast, that of small nonborrowers was 34 percent. These differences also are evident when all borrowing banks' ratios are compared with those of all nonborrowing institutions, regardless of size (Chart 2).

SUMMARY AND CONCLUSION

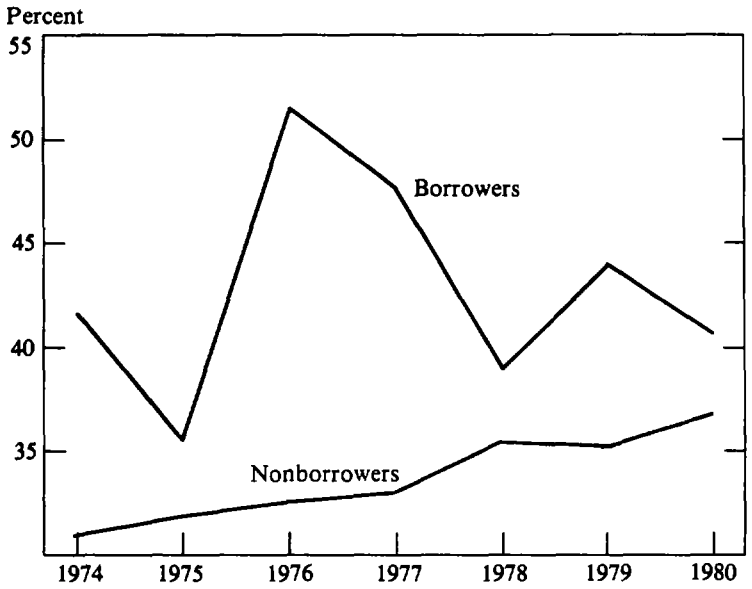
Despite the longevity of the Federal Reserve's seasonal borrowing privilege, few studies have been published that examine Reserve Banks' lending experience under the program. This study has reviewed the background of the SBP and changes in its administration. In addition, expected characteristics of banks eligible to participate in the program were compared with those of Tenth District seasonal borrowers. The Tenth District experience with the SBP between 1974 and 1980 demonstrated that the expected characteristics of smaller size, rural location, and agricultural orientation were evident in banks eligible to use the program. The proportion of agricultural loans did not significantly influence use of the SBP, nor did multibank holding company affiliation or location. Large banks tended to use the SBP more than small banks. However, the significantly greater loan to deposit and net fund availability variance

Chart 1
VARIANCE IN NET FUND AVAILABILITY FOR BORROWERS OF SEASONAL CREDIT IN THE TENTH FEDERAL RESERVE DISTRICT BY DEPOSIT SIZE: 1974-80



Note: Variance of net fund availablity (NFA) = $\frac{\text{Mean of peak NFA minus lowest NFA}}{\text{Peak NFA}}$

Chart 2
VARIANCE IN NET FUND AVAILABILITY FOR TENTH FEDERAL RESERVE DISTRICT BANKS ELIGIBLE FOR THE SEASONAL BORROWING PRIVILEGE: 1974-80



Note: Variance of net fund availability (NFA) = $\frac{\text{Mean of peak NFA minus lowest NFA}}{\text{Peak NFA}}$

ratios exhibited by small Tenth District borrowers suggest that these institutions faced greater seasonal needs for credit and accommodated a higher volume of nonseasonal loan demand in their communities than small nonborrowers.

A primary benefit of the SBP is that seasonal credit represents an assured, dependable source of funds to eligible institutions every year, regardless of the business cycle. The continued availability of seasonal credit may have given bankers the confidence to maintain a more fully loaned position during the year, thereby enhancing these financial institutions' contribution to community welfare. The Tenth District experience tends to support a conclusion that the SBP has served the objectives for which it was established.

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