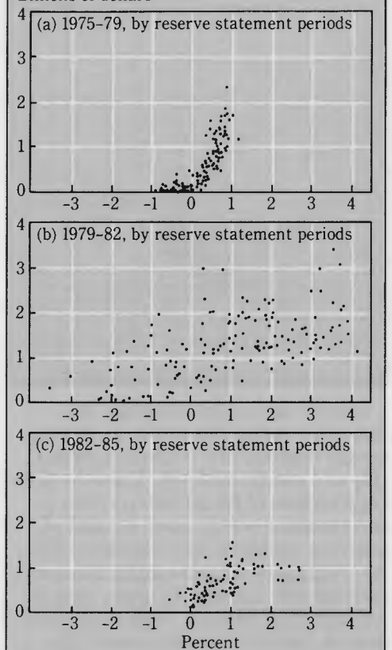
Chart 4 The Borrowing Function

Billions of dollars



SOURCE: Board of Governors of the Federal Reserve System.

that the relationship grew less exact, and the responsiveness of borrowing to the rate spread apparently declined. These changes were probably a result of increased uncertainty about Federal Reserve policy and about future federal funds-discount rate spreads.[6] Banks tend to be more cautious about using their discount-window privileges (resulting in the flatter slope) and are more prone to error (resulting in increased variability), the less certain they are about future rate spreads.

When monetary policy procedures were modified in 1982, insulating the federal funds rate and borrowing from the vagaries of weekly money supply growth, the reliability in the borrowing relationship increased, and borrowing became more responsive to changes in the rate spread. Yet, while chart 4c clearly shows this, it also reveals that the relationship was nonetheless flatter and more scattered between 1982 to 1985 than it was between 1975 and 1979.

A number of factors may account for this. First, the federal funds-discount rate spread remained more volatile than it was during the 1975 to 1979 period. Second, there may have been some lingering uncertainty from previous operating procedures. The shift in procedures in late 1982 was gradual, and banks were slow to realize how Federal Reserve operations were being conducted. Finally, even though current procedures tend to smooth the federal funds rate, they nevertheless retain the structure of the 1979 to 1982 procedures (that is, biweekly nonborrowed reserve objectives are sought that force target amounts of borrowing into the discount window). The federal funds rate is freer to move with market forces than under federal funds targeting, leading to greater uncertainty about future rate spreads.

Summary

In the clean world of textbook models, individual banks' demand functions for borrowed reserves result in an upward sloping reserve supply relation, commonly referred to as the borrowing function. This can be used by the Federal Reserve in its attempt to successfully implement monetary policy. Observation, however, reveals that the relationship is, by no means, exact. It has often been volatile, and both the volatility and slope of the relationship appear to have changed from time to time, particularly with respect to different operating procedures. How much these factors affect the outcome of monetary policy is a matter of debate.

Washington, DC: Board of Governors of the Federal Reserve System, August 1982. This linear regression model was estimated for illustrative purposes only. It was not intended to scientifically model the borrowing function, which would require better specification and more sophisticated estimation techniques.

6. Several economists have advanced this hypothesis. See Peter Keir, "Impact of Discount Policy Procedures on the Effectiveness of Reserve Targeting," *Federal Reserve Staff Study—Volume I New Monetary Control Procedures*, Board of Governors of the Federal Reserve System, February 1981; D. H. Resler et al. (August 1982); and Marvin Goodfriend, "Discount Window Borrowing, Monetary Policy, and the Post-October, 1979 Federal Reserve Operating Procedure," *Journal of Monetary Economics*, vol. 12, no. 3 (September 1983), pp. 343–56.

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ECONOMIC COMMENTARY

Reserve Borrowings and the Money Market

by Richard L. Mugel

One of the functions of the Federal Reserve System is to provide loans to depository institutions (generally, banks) in each district through what is figuratively known as the "discount window."

These loans help banks to overcome temporary liquidity problems, to adjust their investment portfolios to sudden changes, and to handle emergency situations when other sources of credit are unavailable.

The discount window also plays an important role, however, as a monetary policy instrument. In this capacity, monetary policymakers rely on a systematic relationship observed between the volume of borrowing at the discount window and the difference (spread) between the federal funds rate and the discount rate. The federal funds rate is the rate charged for loans in the interbank market for bank reserves, while the discount rate is the rate charged for borrowing reserves at Federal Reserve Banks. In general, greater or lesser amounts of borrowing tend to be associated with wider or narrower spreads between the federal funds rate and the discount rate.

In this *Economic Commentary*, we explore how borrowing and the spread interact, review the monetary policy role of this relationship, and discuss some changes in this relationship that have taken place in recent years.

Table 1 Discount Window Administration Numerical Guidelines

Size of bank (domestic deposits)	Consecutive weeks borrowing	Weeks of borrowing within: 13 weeks	Weeks of borrowing within: 26 weeks	Borrowing as a percent of domestic deposits
Under $200 million	4 - 5	6 - 7	7 - 8	2.0
$200 million - $1 billion	3 - 4	5 - 6	7 - 8	2.0
$1 billion - $3 billion	2 - 3	4 - 5	6 - 7	1.5
More than $3 billion	1 - 2	3 - 4	4 - 5	1.0

SOURCE: Board of Governors of the Federal Reserve System.

The Anatomy of Borrowing

Federal Reserve loans fall into three categories. Loans that allow depositories to adjust their portfolios to unanticipated deposit and loan activity are called *adjustment credit*. *Seasonal credit* loans allow certain institutions (farm banks, for example), special access to the window to fund seasonal activities, such as planting and harvesting. This credit program exists for those institutions that do not have ready access to alternative funding in the national money markets. The *extended credit* program is designed to fulfull longer-term needs resulting from prolonged cash flow problems of depository institutions.[1]

Loans are granted at each of the 12 Federal Reserve district banks. While loans are approved at the discretion of each bank, the extension of discount-window credit is not arbitrary. Borrowing is guided by Federal Reserve Regulation A, issued under the authority of the Federal Reserve Act, as amended by the Monetary Control Act of 1980.

According to the guidelines, banks must have an appropriate reason for borrowing and must have sought alternative sources of funding first. Appropriate reasons for borrowing include (1) liquidity needs arising from unanticipated deposit or loan activity, (2) the avoidance of overdrafts in reserve accounts and, (3) liquidity needs arising from outside forces, such as wire transfer failures.

Inappropriate reasons include borrowing to take advantage of a favorable spread between the discount rate and rates on other sources of funds, or for supporting loan and investment activity.[2] In addition, the Federal Reserve sets guidelines pertaining to the appropriate amount, frequency, and duration of discount-window borrowing for banks of different size (see table 1).

In spite of these regulations, casual observation reveals that the volume of adjustment and seasonal borrowing at the discount window is quite sensitive to movements in money market interest rates, suggesting that depositories, as a matter of policy, consider favorable rate spreads in their borrowing decisions. A positive relationship between borrowing and the spread of the funds rate over the discount rate is not by itself at odds with discount-window guidelines. It is, in fact, perfectly consistent with the behavior predicted by economic theory.

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The views expressed herein are those of the author and not necessarily those of the Federal Reserve Bank of Cleveland or of the Board of Governors of the Federal Reserve System.

1. Because of the special circumstances under which it is typically issued, the volume of extended credit borrowing tends to be relatively insensitive to changes in short-term interest rates and is, therefore, excluded from most expressions of the borrowing function.

2. For more information on Regulation A and discount window guidelines, see *The Federal Reserve Discount Window*, Board of Governors of the Federal Reserve System, October 1980.

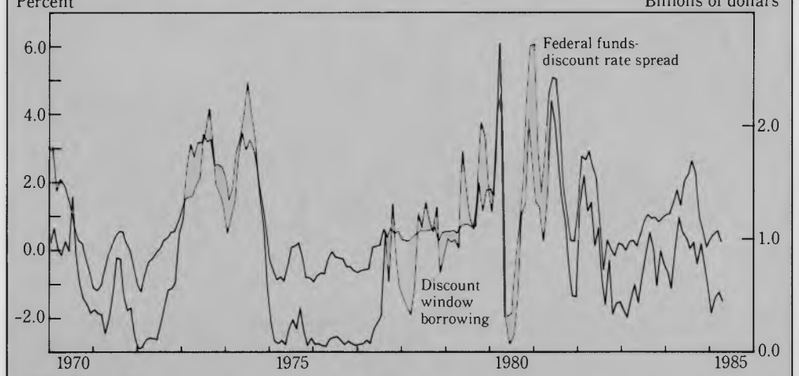
Understanding the Borrowing Relationship

Traditionally, economists have advanced two theories to explain banks' behavior at the discount window: the profit theory and the need theory.[3] According to the profit theory, depository institutions borrow at the discount window, and repay those loans, whenever it is profitable. The need theory states that institutions are naturally reluctant to increase their indebtedness at Federal Reserve Banks and will borrow only when they have to.

Neither of these hypotheses, however, offers a complete explanation. Taken together, both the need and the profit theories of borrowing are able to explain the discount-window behavior of depository institutions and to account for the observed relationship between borrowing at the discount window and the spread between the federal funds rate and the discount rate. The most common approach to understanding the borrowing relationship begins with the standard microeconomic assumption that banks seek to maximize their profits. Consequently, they make calculated decisions, weighing the perceived cost of a particular activity against its expected benefits.

The discount rate, however, does not adequately depict the actual cost of discount-window borrowing. Depositories also have to consider the opportunity cost of borrowing. Federal Reserve regulations limit the use of discount-window credit and limit the volume, frequency, and duration of borrowing. By applying for a discount-window loan today, therefore, a bank may lose easy access to the window at a later date. Such a lost opportunity would be costly if, for example, in the near future the federal funds rate were to rise well above the discount rate. Many institutions may not be willing to take the risk of threatening their future opportunity to borrow, unless a favorable gap between the federal funds rate and the discount rate presents itself.

Chart 1 Borrowing and the Rate Spread



SOURCE: Board of Governors of the Federal Reserve System.

As a consequence, banks must consider past borrowing, future rate spreads and expected future needs in their current borrowing decisions. This concept can be understood by means of the following analogy: imagine a bank that has a limited number of tickets to the discount window for use during a specified period. Since it can't predict its future need to borrow, the bank will conserve its tickets, using them when it is to its greatest advantage. This approach is consistent with the profit theory of borrowing.

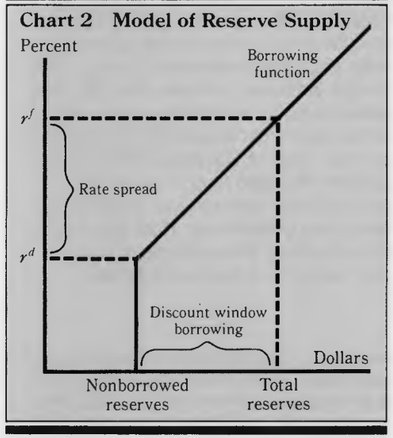
In addition to opportunity cost, there are other considerations that encourage banks to seek alternative funding before turning to the discount window. A bank may be reluctant, for example, to risk facing reprimands from Federal Reserve discount-window officers should its reason for borrowing be considered inappropriate. Inappropriate and excessive loan requests may jeopardize future access to the window and invite greater scrutiny from federal regulators. Banks also may wish to avoid borrowing at the window because, were it to become known in the market, it might be interpreted as a sign of weakness that would increase the costs of borrowing in the market. (Even though the names of borrowing institutions are not disclosed by Federal Reserve Banks, banks nevertheless fear discovery.) Because of these risks, depositories generally try to avoid borrowing at the discount window. As a result, they are willing to pay a higher price for money from alternative sources and, before borrowing, will search out these alternatives first. Significantly higher premiums in the marketplace, however, induce banks to overcome their reluctance to borrow from the System; guided by the profit motive, they will come to the discount window.

The theoretical foundation upon which the borrowing function rests, therefore, is the microeconomic behavior of individual banks. Considering all costs—explicit and implicit—in their decision to borrow, banks seek to maximize profits. The result is a positive relationship between the volume of borrowing at the discount window and the Federal funds-discount rate spread. This relationship can be exploited by the Federal Reserve in its conduct of monetary policy. By regulating the supply of nonborrowed reserves, the System is able to determine reserve market pressures and to influence the aggregate level of borrowing.

The Borrowing Relationship and Monetary Policy

Federal Reserve policymakers seek to foster conditions that are expected to promote price stability and economic growth. The System uses bank reserves as a tool, controlling at any one time either the quantity of reserves or their price (the federal funds rate). Prior to 1979, the Federal Reserve placed greater emphasis on levels of the federal funds rate that were thought to be consistent with desired money supply growth. The relationship between borrowing and the federal funds rate took on a more important role after October 1979, when the Federal Reserve sought to gain better control over money supply growth by focusing more closely on the quantity of bank reserves in its operating strategy. Despite changes in procedures and strategies since 1979, the importance of the borrowing relationship to monetary policy has persisted.

Chart 2 Model of Reserve Supply



Under nonborrowed reserves targeting, the procedure employed between 1979 and 1982, target paths for nonborrowed reserves (reserves supplied through open-market operations) were set to produce a federal funds rate and a level of total reserves thought to be consistent with a desired growth in the money supply. Any excess of reserve demand above the amount supplied though open-market operations had to be met at the discount window, resulting in a widening of the spread between the federal funds rate and the discount rate.

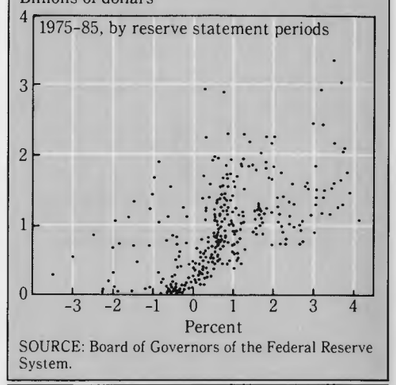
In late 1982, procedures guiding open-market operations were modified because the usefulness of M1 as a guide for monetary policy operations diminished as the introduction of new deposit instruments altered the relationship between M1 and economic activity. Under the newer procedure, known as borrowed reserves targeting, the System seeks target levels of adjustment and seasonal borrowing that are expected to produce a desired degree of reserve pressure, allowing nonborrowed reserves to vary with changes in reserve demand.[4] Unlike nonborrowed reserves targeting, deviations in reserve demand from reserve supply, as a rule, are met through open-market operations, not borrowing, and consequently do not automatically lead to higher levels of borrowing and tighter reserve market conditions. This approach to interweek variations in reserve demand, has tended to moderate the intensity of fluctuations in the federal funds rate.

In both nonborrowed and borrowed reserve targeting, the System has relied on an upward sloping reserve supply curve, which means that more reserves are supplied at greater federal funds-discount rate spreads (see chart 2). Because depositories tend to seek other sources of funds before turning to the discount window, pressure in the money market drives short-term interest rates, particularly the federal funds rate, higher which, in turn, induces banks to overcome their reluctance to borrow at the discount window.

Observing the Borrowing Function

While there might appear to be a simple and precise relationship between borrowing and the rate spread, this is really not the case. Chart 3, which shows adjustment and seasonal borrowing plotted against the federal funds-discount rate spread between 1975 and 1985, reveals both a clear relationship and yet a wide dispersion of plotted values. Linear regression estimates of the borrowing function, using the spread as an explanatory variable, over a sample from 1975 to 1985, explain 80 percent of the variation of borrowing, but show a standard error of $313 million.[5]

Chart 3 The Borrowing Function



SOURCE: Board of Governors of the Federal Reserve System.

Several factors may explain the short-run variability in the borrowing-spread relationship. Some are predictable and can be modeled. These include expectations of future interest rates and seasonal events, such as ends of quarters, holidays, and tax dates. The other category includes chance factors, such as wire transfer failures, deposit and loan fluctuations, random fluctuations in banks' attitudes toward the discount window and management of reserve balances, and the degree of uncertainty about Federal Reserve policy and future rate spreads.

A closer look at the borrowing relationship reveals noticeable changes in the slope and reliability of the borrowing relationship over time, particularly with respect to different Federal Reserve operating procedures. The slope of the borrowing relation indicates the responsiveness of borrowing to the federal funds-discount rate spread. Steeper slopes indicate greater responsiveness of borrowing to the spread. The scatter of plotted values on the other hand, gives a clue about the reliability of the borrowing relationship, how likely it is that a given spread will produce a predictable level of borrowing.

Chart 4a shows that between 1975 and 1979, when the Federal Reserve was targeting the federal funds rate, the borrowing relationship was relatively reliable, and borrowing was highly responsive to changes in the rate spread. Under nonborrowed reserve targeting (chart 4b), the scatter of points indicates

3. See Robert C. Turner, *Member-Bank Borrowing*. Columbus, OH: Ohio State University, 1938.

4. In daily and weekly practice, the borrowed and nonborrowed reserve procedures look identical: reserves are supplied or withdrawn in order to maintain a nonborrowed reserve objective. The difference is in the calculation of that objective. The nonborrowed reserves procedure derived the objective from a target for total reserves, with an allowance for borrowing. The borrowed reserves procedure subtracts a target for borrowed reserves from the estimated total reserve needs of the banking system.

5. The borrowing function was estimated using weekly and biweekly (reserve statement period) data between 1975 and April 1985, using a static coefficients model of the form discussed in D. H. Resler et al., "Detecting and Estimating Changing Economic Relationships: The Case of Discount Window Borrowings," *Special Studies Paper 165*,