Reserve targeting and discount policy

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The recent approval in principle by the Board of Governors of the Federal Reserve System of a return to a modified form of contemporaneous reserve accounting[1] raises important questions regarding the role of Federal Reserve discount policy.[2] This article analyzes the factors that enter into an individual bank's decision to borrow from the Fed for short-term reserve adjustment purposes and how the borrowing function for the banking *system* relates to the determination of the federal funds rate—the "cutting edge" of monetary policy in terms of the money supply process. Finally, it briefly discusses the implications for discount policy of the proposed move to a modified form of contemporaneous reserve accounting.

Prior to October 6, 1979 the Fed conducted open market operations so as to hit a targeted federal funds rate that the Federal Open Market Committee (FOMC) thought consistent with its desired money growth.[3] Borrowed reserves simply fell out as a residual from the actions taken by the Fed to maintain the targeted federal funds rate. As a result, neither discount policy per se nor knowledge of the relationship between discount window borrowing and the federal funds rate was of great significance for monetary control purposes.

The situation is quite different under the Fed's current nonborrowed reserve targeting procedure adopted October 6, 1979. Under this procedure, the FOMC chooses an initial level of reserve adjustment borrowing through the discount window (referred to as the borrowing assumption) that appears consistent with the achievement of the Committee's monetary growth objective over the period until its next meeting. Then the Federal Reserve Board staff estimates an average level of total reserves conditioned upon the FOMC's monetary growth objectives, reserve requirement ratios, and estimates of several key variables, including reservable liabilities other than those included in the FOMC-targeted monetary aggregates, excess reserves demanded by banks, and currency demanded by the public. The final step is to derive the nonborrowed reserve target by subtracting the FOMC's borrowed reserve assumption from the Board staff's estimate of total reserves.

Suppose that the monetary aggregates start to grow faster than the FOMC desires. This higher-than-desired monetary growth results in more rapid growth in required reserves and (assuming no change in banks' demands for excess reserves) total reserves relative to the targeted level of nonborrowed reserves. As a result, borrowed reserves would rise. For reasons to be discussed below, this increase in borrowed reserves, all else the same, tends to push up both the federal funds rate—the rate charged on interbank loans

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[1]As currently discussed the proposal would involve a two-week settlement period, with the reserve settlement period beginning and ending two days later than the reserve computation period.

[2]Discount policy refers to the level at which the discount rate is set and the Reserve Banks' administration of the discount window borrowing privilege.

[3]Although the federal funds rate is simply the cost of one source of funds among many, it is of special significance in the money supply process. Federal funds borrowing is a close substitute for discount window borrowing as a source of short-term adjustment credit and changes in it are quickly reflected in other short-term rates.

with short, usually one-day, maturities—and rates on funds from other sources. As under the old operating procedure, higher funding costs discourage banks from acquiring additional earning assets, culminating in a slowdown in money growth. Conversely, slower-than-desired monetary growth leads to slower growth in required and (assuming, again, no change in excess reserves) total reserves relative to the targeted level of nonborrowed reserves supplied by the Fed; a reduction in borrowing at the discount window; a fall in the federal funds rate; and, ultimately, an increase in money growth.

The basic change in monetary control under the new operating procedure, as contrasted to the old procedure, is that the Fed no longer pegs the federal funds rate in the short run. Rather, it translates the desired degree of restrictiveness or ease into an initial borrowed reserves assumption and, hence, a target for nonborrowed reserves. Adherence to the nonborrowed reserve target means that the federal funds rate is free to fluctuate in the short run. Nevertheless, the average level of the federal funds rate—assuming the Fed has picked the proper target level for nonborrowed reserves—should be such as to produce the desired rates of monetary growth. Thus, the relationship between discount window borrowing for short-term reserve adjustment reasons[4] and the federal funds rate is crucial in the monetary control process under the Fed's current nonborrowed reserve targeting procedure.

Individual banks' demands for borrowed reserves

For an individual bank, the decision to borrow from the discount window is part of a larger decision regarding the size and composition of its portfolio. Assuming expected profit maximization, a bank acquires earning assets up to the point at which the present value of the expected return on an additional dollar of assets is equal to the present value of the expected cost of funding that additional dollar of assets over its term to maturity.[5] From the standpoint of an individual bank, borrowing from the discount window is just one source of funds among many others, including federal funds, CDs, RPs, etc. The profit-maximizing bank will allocate its acquisition of funds among the different available sources so as to equate the cost of the last dollar raised from each source for the same time period.

If banks could borrow from the discount window in unlimited quantities, with unlimited frequency, and for unlimited periods of time, no bank would be willing to pay a higher rate for funds than the discount rate. The fact that the costs of alternative sources of funds are often above the discount rate is indicative that banks cannot borrow from the discount window at will. That is, the administration of the window by Reserve Bank discount officers introduces elements of nonprice rationing, often referred to as surveillance costs, in addition to the explicit cost of the discount rate. These costs take the form of close monitoring by the discount officer of the bank's asset and liability behavior, informal pressure to make asset adjustments that will enable the bank to pay off its borrowing at the window, and the implicit threat that the bank may not be accommodated at the window at some future date if it "abuses" its borrowing privileges now. The total of such costs—and, importantly, the cost per dollar of borrowing—varies directly with the amount, frequency, and duration of borrowing.

Because of their limited access to the discount window, banks will attempt to save

[4]Because borrowings under the extended credit program do not have to be repaid as promptly as traditional adjustment borrowings, their money market impact is similar to that of nonborrowed reserves and they are treated as such in implementing monetary policy. For the purposes of this article, credit extended by the Federal Reserve Banks under the seasonal borrowing privilege is also excluded from adjustment borrowings.

[5]These conclusions abstract from the problem of risk. To the extent that the bank is concerned about the variance, or risk, associated with the level of expected profits, the conclusions would have to be modified slightly.

their borrowing privileges for the most profitable occasions. Presumably, those occasions would occur when the costs of alternative sources of funds were high relative to the discount rate and when this cost differential or spread was expected to narrow over some relevant time horizon.

Figure 1 is a simplified graphical representation of the summation of individual banks' demands—i.e., the banking system's demand—for borrowed reserves in relation to the spread between the federal funds rate and the discount rate. The positive slope of line OA indicates that, as the federal funds rate-discount rate spread widens, the demand for borrowed reserves increases.[6] At spread SP^0, borrowed reserves BR^A will be demanded.

Two of the major determinants of the relationship between aggregate bank borrowing and the current spread between the federal funds rate and the discount rate are the administration of the window by the 12 Reserve Banks and, given banks' concern to preserve their borrowing privileges in the future, their expectations of future spreads between the federal funds rate and the discount rate.

Administration of the discount window

At each Reserve Bank, discount administration is guided by established criteria in judging the appropriateness of a bank's request for short-term reserve adjustment credit. These criteria include the reason for the borrowing, the amount of borrowing requested as a percentage of the bank's domestic deposits, the number of consecutive weeks the bank has borrowed, and the number of weeks within some specified period (e.g., a 13-week or 26-week period) that a bank has borrowed.

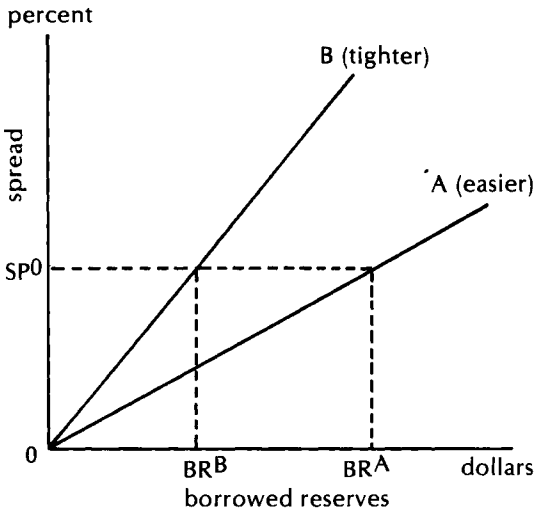
In recent years, efforts have been made to standardize window administration across Federal Reserve districts through a more precise definition of appropriate reasons for borrowing and through more uniform numerical guidelines for duration and frequency of borrowing. Each Reserve Bank's discount officer, however, still exercises discretion in judging the appropriateness of borrowing. Moreover, within the guideline categories, different subjective and quantitative weights are applied to borrowing requests depending on the size of the bank seeking reserve adjustment credit. Typically, less administrative pressure is applied to smaller banks, because their alternative sources of adjustment credit are more limited than those of larger banks.

The slope of the aggregate bank borrowing function in figure 1 depends both on the 12 Reserve Banks' combined administration of their respective discount windows and on banks' perceptions of this administration. "Tighter" administration results in a more steeply sloped borrowing function such as OB in figure 1. In this case, for any given spread between the federal funds rate and the discount rate, a relatively smaller amount of borrowed reserves will be demanded by the banking system under a "tighter" administration of the window. At the spread SP^0 in figure 1, the amount of borrowed reserves will be BR^A under relatively easier administration of the discount window but only BR^B under tighter discount window administration.

The borrowing function can be expected to vary from week to week due to many factors, including (but not restricted to) the duration of individual banks' previous borrowing, the sizes of banks requesting adjustment credit, and the variability of window administration among District Reserve Banks. In addition, banks' attitudes about borrowing from the window are quite diverse. Some banks are quite reluctant to borrow while

[6]Strictly speaking, banks do not base borrowing decisions on the spread between the federal funds rate and the nominal discount rate per se, but on the spread between the federal funds rate and the effective discount rate—i.e., the nominal discount rate plus surveillance costs. Although the latter vary with the amount of borrowing, they are not directly observable. However, if banks borrow from each source up to the point where marginal costs are equal, the federal funds rate-discount rate spread will just measure the annualized per dollar surveillance costs of discount window borrowings at each level of borrowing.

Figure 1:
Slope of aggregate borrowing function depends on tightness of discount window administration



NOTE: The borrowing functions OA and OB are drawn through the origin for expositional simplicity. These functions could intersect the horizontal axis at positive levels of borrowings to illustrate that some borrowing, especially by smaller banks, occurs even when the federal funds rate-discount rate spread is zero or negative.

Symbols used in figures 1-4 are defined as follows: R_{FF} = federal funds rate, R_D = discount rate, spread (SP) = $R_{FF} - R_D$, BR = borrowed reserves, NBR = nonborrowed reserves, and RR = required reserves.

others are much less inhibited. For example, large banks typically borrow for only one day at a time. Thus, a given spread between the federal funds rate and the discount rate would be expected to result in a relatively large amount of borrowing in a week when a disproportionately large number of small banks with little reluctance to borrow, and which have borrowed sparingly in recent weeks, come to the discount windows in Districts with less stringent administration. In practice, week-to-week variations in borrowing are dominated by borrowings by a relatively few large banks, usually as the result of miscalculations of reserve flows toward the end of the settlement week.

Expectations of future rate spreads

Banks' expectations of the federal funds rate-discount rate spread in the near future and the confidence with which they hold those expectations also will affect the aggregate bank borrowing function. If banks expect the spread to widen, they will tend to borrow less from the window at the current spread than if they expect the spread to narrow. They would want to save their borrowing privileges for more profitable future occasions.

Moreover, in an era of low federal funds rate variability, a small increase in the spread might induce a large increase in borrowing because of the high probability that the spread will narrow in the future. Even if the spread did not narrow, the cost of being wrong in spread forecasting would be relatively small, given the low variability of the federal funds rate.

In contrast, when there is greater federal funds rate variability, banks have less confidence that a given small increase in the spread will narrow in the future, and the cost of wrong predictions about future rate movements could be higher. In this case, an increase in the spread might induce a relatively small increase in borrowing.

Relevance of the borrowing function under nonborrowed reserve targeting

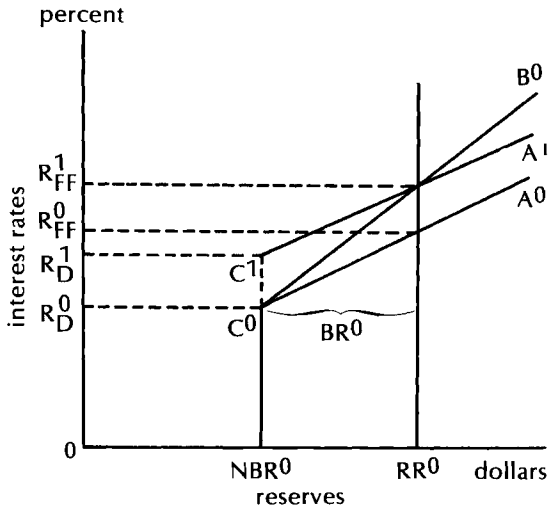
So far, the analysis has suggested that each individual bank is free to choose how much to borrow from the window. For the banking system as a whole, however, a certain minimum level of borrowing in a given week is fixed once the FOMC sets the level of nonborrowed reserves. This predetermination of a weekly minimum level of aggregate bank reserve adjustment borrowing is a consequence of lagged reserve accounting—the system used since 1968 in which the calculation of required reserves in the current week is based on the level of reservable deposits that banks held two weeks earlier. If, in a given week, the (predetermined) level of

required reserves exceeds the level of nonborrowed reserves targeted and provided by the Federal Reserve, then aggregate borrowing must be at least large enough to make up the shortfall in required reserves.[7] Although an individual bank can make up its reserve deficiency by purchasing federal funds, selling CDs, etc., the banking *system* can repair its reserve deficiency only by borrowing from the Federal Reserve. As banks bid for funds in the market, interest rates begin to rise. It is this rise in rates relative to the discount rate that eventually induces some banks to borrow voluntarily the amount needed to bring aggregate reserve demand (required reserves plus excess reserves) into equality with aggregate reserve supply (nonborrowed reserves plus borrowed reserves).

If the monetary aggregates and, therefore, required reserves are growing faster than the FOMC's targets, then monetary policy works by forcing the banking system to borrow more for reserve adjustment purposes, bringing about increases in the federal funds rate and in rates on funds from other sources. The higher cost of funds, all else the same, induces the banking system to reduce (or slow the growth of) its earning assets and, thus, its deposits.[8]

Figure 2 is a graphical representation of this model of federal funds rate determination. The line C^0A^0 in figure 2 corresponds to the borrowing function OA in figure 1. The vertical line segment at NBR^0 indicates the amount of nonborrowed reserves supplied by the FOMC. The vertical line RR^0 indicates

Figure 2:
Under nonborrowed reserve targeting, increase in discount rate or in slope of borrowing function leads to higher federal funds rate



the level of required reserves for the banking system. Notice that the policy implications of a specified nonborrowed reserve (or, implicitly, borrowed reserve) target depend critically on the level of the discount rate and the shape of the aggregate bank borrowing function (i.e., the slope of line C^0A^0).

All else the same, a higher discount rate will result in a higher federal funds rate and slower money growth. An increase in the discount rate from R^0_D to R^1_D is illustrated in figure 2 by the upward parallel shift in the borrowing function C^0A^0 to C^1A^1 reflecting the higher discount rate R^1_D and resulting in an increase in the federal funds rate from R^0_{FF} to R^1_{FF}. The same qualitative results will obtain if banks' demand for borrowed reserves should decrease in the current week due to a change in one or more of the factors that determine this demand (e.g., banks revised upward their expectations of the future spread between the federal funds rate and the discount rate). In terms of figure 2, this

[7]This abstracts from reserve carryover, i.e., the privilege banks have of carrying over a surplus or deficiency of up to 2 percent of required reserves into the following reserve settlement week. It also abstracts from banks' demand for excess reserves. To the degree that some banks wish to hold excess reserves, the aggregate amount borrowed from the window in a given week will equal the aggregate shortfall in nonborrowed reserves compared to required reserves plus the amount of excess reserves desired by the banking system.

[8]For a more detailed description of the money supply process, see Robert D. Laurent, "Lagged Reserve Accounting and the Fed's New Operating Procedure," *Economic Perspectives*, Federal Reserve Bank of Chicago (Midyear 1982), pp. 32-43.

Box 1

In order to investigate the relationship between reserve adjustment borrowing and the federal funds rate-discount rate spread (hereafter referred to as the spread), equation (1) in the table below was estimated using weekly average data from the week ending January 5, 1972, through October 3, 1979. The coefficient on the spread variable used to explain adjustment borrowings in equation (1) has the expected positive sign, indicating that banks increase adjustment borrowings as the spread widens.

An econometric problem arises if the same equation specification is used for the period after October 6, 1979. Before October 6, 1979 the FOMC directly targeted the federal funds rate and implicitly targeted the spread, given the level of the discount rate. Therefore, the spread could be considered an independent variable in explaining the level of adjustment borrowing. Since October 6, 1979, however, the FOMC has targeted nonborrowed reserves on a weekly basis. Because lagged reserve accounting implies a predetermined level of required reserves in any given settlement week, nonborrowed reserve targeting in effect "forces" a minimum amount of reserve adjustment borrowing onto the banking system. This minimum amount is equal to the shortfall of nonborrowed reserves supplied in any given settlement week below the amount needed to satisfy reserve requirements. From an econometric standpoint, the major implication is that a strong case can be made for treating borrowed reserves for the banking *system* as an independent variable in explaining the spread. This argument holds for the aggregate specification relating to the banking system even though individual banks take the spread as given and adjust their borrowings to it.

Taking this independence of reserve adjustment borrowings into account, equation (2) shown in the table below relates the spread to aggregate borrowings and to the imposition of the discount rate surcharge[1] using weekly average data for the

		Independent variables							
Equation	Dependent variable	Intercept	$(R_{FF} - R_D)$	BR	DUMSUR	SEE	$\bar{R}^2$	DW	Rho
(1)	Borrowed reserves (BR)	.435 (11.11**)	.427 (16.75**)			.259	.84	2.21	.64
(2)	Federal funds rate-discount rate spread	1.015 (1.23)		.696 (3.72**)	1.033 (2.01*)	.850	.89	1.94	.89

SYMBOLS: BR = reserve adjustment borrowing excluding seasonal and extended credit (in billions of dollars).
$(R_{FF} - R_D)$ = spread between the federal funds rate and the discount rate (in percent).
DUMSUR = a dummy variable equal to one during weeks when the surcharge was imposed and zero otherwise.

NOTE: SEE denotes the standard error of the estimate, $\bar{R}^2$ denotes the coefficient of determination corrected for degrees of freedom, DW denotes the Durbin-Watson statistic, and Rho denotes the estimated parameter in a first-order serial correlation correction. Parenthetical entries below the estimated coefficients are t-statistics with double asterisks (**) indicating statistical significance at the .01 level and single asterisks (*) indicating significance at the .05 level.

change in expectations is represented by the more steeply sloped borrowing function C^0B^0, resulting in the higher federal funds rate R^1_{FF}. A given level of nonborrowed reserves, therefore, can result in various levels for the federal funds rate—and the money supply—depending on the level of the discount rate, the ease or tightness of discount window administration, and the other factors that influence banks' demands for borrowed reserves.

Prior to October 6, 1979, when the FOMC

period from October 10, 1979 to July 29, 1981. The coefficients on both independent variables have the expected positive signs, indicating that the spread between the federal funds rate and the discount rate widens either as adjustment borrowing rises or when the surcharge is imposed.

Because of the need to treat borrowings as an independent variable, a reliable specification of the borrowings equation, such as in equation (1), cannot be estimated for the post-October 6, 1979 period. As a result, the usual econometric tests for structural changes in the borrowing function across FOMC operating policy regimes are inapplicable. However, a stability test for the borrowing-spread relationship across policy regimes can be performed using the partial correlation coefficient—i.e., the familiar simple correlation coefficient adjusted for the influence of additional variables. The relevant partial correlation coefficients are calculated from the t-statistics of the coefficient on the spread variable in Subperiod I and the coefficient on the borrowing variable in Subperiod II, respectively, by the following formula:

$$t / \sqrt{t^2 + n - k}$$

where t denotes the t-statistic; n denotes the number of observations; and k denotes the number of independent variables (including the intercept).[2]

The partial correlation coefficient between borrowed reserves and the spread went from 0.641 in the pre-October 6 period to 0.362 in the post-October 6 period—a 43 percent decline. This reduced correlation indicates greater uncertainty in the relationship between reserve adjustment borrowing and the spread in the post-October 6 subperiod. Consequently, it became more difficult during the second subperiod to forecast the effects of policy changes that now depend on this relationship.[3] This has interesting implications for monetary control, particularly if lagged reserve accounting is taken as given. It suggests that, if policymakers were willing to move the federal funds rate as much as it has been allowed to move under the post-October 6 operating procedure, control of money might, in principle, be superior under a direct federal funds rate targeting procedure. At least the perceived "appropriate" federal funds rate could be achieved on a weekly basis with a high degree of accuracy under such a procedure, even though the precise relationship between the federal funds rate and the money supply might remain difficult to ascertain.

[1]In 1980 and 1981, the Federal Reserve applied a surcharge to short-term adjustment credit borrowings by institutions with deposits of $500 million or more that had borrowed in successive weeks or in more than four weeks in a calendar quarter. A 3 percent surcharge was in effect from March 17, 1980, through May 7, 1980. There was no surcharge until November 17, 1980, when a 2 percent surcharge was adopted; the surcharge was subsequently raised to 3 percent on December 5, 1980, and to 4 percent on May 5, 1981. The surcharge was reduced to 3 percent effective September 22, 1981, and to 2 percent effective October 12. As of October 1, the formula for applying the surcharge was changed from a calendar quarter to a moving 13-week period. The surcharge was eliminated on November 17, 1981.

[2]For a derivation of this formula, see Henri Theil, *Principles of Econometrics* (John Wiley & Sons, 1971), p. 174.

[3]It is not possible to say that the decline in correlation between reserve adjustment borrowing and the spread was due to the FOMC's adoption of nonborrowed reserve targeting. Other changes in the economy that occurred at approximately the same time may be responsible for the decline.

was directly targeting the federal funds rate, the effects on the federal funds rate of changes in the discount rate or in the aggregate borrowing function were quickly offset by changes in nonborrowed reserves via Federal Reserve open market operations. In figure 3, for example, if the borrowing function should change from C^0A^0 to the more steeply sloped C^0B^0, all else the same, the federal funds rate in that week would rise from R_{FF}^0 to R_{FF}^1. However, if the Fed were targeting a federal funds rate of R_{FF}^0, then open market operations would be undertaken to increase nonborrowed reserves from NBR^0 to NBR^1

Box 2

Implications of uneven intraweek borrowing patterns

One of the problems posed by the decreased stability of the relationship between borrowed reserves and the federal funds rate-discount rate spread, as indicated by preliminary econometric evidence (See box 1), is that the FOMC at times could be faced with an undesirable tradeoff resulting from banks' intraweek borrowing behavior at the discount window. On these occasions, the FOMC would have the choice of either holding to its nonborrowed reserve target while watching the federal funds rate vary significantly between the early and later days of the settlement week or deviating from its nonborrowed reserve target in order to dampen intraweek movements in the federal funds rate.

To illustrate, suppose nonborrowed reserves were kept on target for the settlement week, but banks had borrowed heavily at the discount window on the first few days of the settlement week. Sufficiently large borrowings early in the settlement period—for example, resulting from banks' expectations that the spread between the federal funds rate and discount rate will narrow later in the week—could lead to weekly average total reserve holdings far in excess of required reserves—i.e., very large excess reserve holdings for the week—even if banks completely repaid their borrowings later in the week. With lagged reserve accounting, this reserve excess would manifest itself in a sharply lower federal funds rate later in the settlement week. This lower federal funds rate, if *interpreted incorrectly* by the public as a more accommodative monetary policy, might actually *produce* above-target money growth resulting from expansionary effects on banks' earning assets.

Any misleading indications to the public of a more accommodative monetary policy should be short lived. In particular, on Friday afternoon following the settlement week ending on Wednesday, the Federal Reserve releases reserve data useful to banks and other market participants for assessing current FOMC policy. These data include the aggregate amount of reserves borrowed from the discount window for Wednesday as well as the daily average level of borrowed reserves for the settlement week ending on Wednesday. From these borrowing components of the release, market participants would be able at least to ascertain that above-average levels of discount window borrowing occurred on some day or days prior to Wednesday.

The Friday data release from the Federal Reserve also includes excess reserve data for the banking system. These excess reserve data, when used in conjunction with the borrowed reserve data, facilitate the calculation of the level of free reserves, defined as excess reserves minus borrowed reserves. Because the FOMC implicitly targets free reserves (also defined as nonborrowed reserves minus required reserves),[1] market participants look at the level of free reserves along with current market rates and other factors in judging the current thrust of monetary policy and in predicting future interest rates for portfolio decision purposes. From the combined information on borrowed reserves and free reserves, the public could deduce that the fall in interest rates late in the relevant settlement week was in fact caused by the large increase in excess reserves attributable to borrowing early in the settlement week—not a fundamental change in the FOMC's monetary policy stance. Again it should be emphasized that this information would become available with a two-day lag on the Friday following the close of the settlement week.[2]

An alternative approach used by the FOMC at times, when faced with this above-projected borrowing early in the settlement week, has been to deviate from its weekly nonborrowed reserve target.[3] On these occasions, the FOMC has pro-

(implying a shift in the curve NBR^0-C^0-B^0 to NBR^1-C^1-B^1 in figure 3 and a decrease in borrowed reserves from BR^0 to BR^1) in order to return the federal funds rate to its desired level, R^0_{FF}.

Similarly, as shown in figure 4, an increase in the discount rate from R^0_D to R^1_D would shift the borrowing function from C^0A^0 to C^1A^1 and would increase the federal funds rate to R^1_{FF}. In order to keep the federal funds rate at its targeted level of R^0_{FF}, the Fed would have to increase nonborrowed reserves to NBR^1, thereby reducing borrowed reserves to BR^1.[9]

vided nonborrowed reserves at levels below their weekly targets in order to prevent the accumulation of large excess reserve holdings and a resulting sharp decline in the federal funds rate. Deviations from the weekly nonborrowed reserve target in such cases would not only dampen federal funds rate volatility but also would produce a lower level of free reserves than implied by the original weekly nonborrowed reserve target. The resulting weekly level of free reserves, if significantly lower than in previous weeks, might be misinterpreted by the public as a shift toward less accommodative monetary policy. In addition, a lower level of free reserves and upward revisions in the public's forecasts of future short-term interest rates might cause banks to reduce their earning asset expansion and thereby *actually* might slow money growth below the growth rate desired by the FOMC.

This misinterpretation of FOMC policy possibly could be corrected in subsequent weeks by returning free reserves to levels close to prevailing levels prior to the week of abnormally high early-in-the-week borrowing. However, increased uncertainty about the interpretation of FOMC policy actions may have been introduced. Specifically, the public would be more uncertain in any given week as to whether the FOMC's policy intentions were being signaled through the behavior of the federal funds rate or through the level of nonborrowed reserves and, implicitly, free reserves. Greater uncertainty of policy intent could cause a delay in the requisite changes in banks' earning assets necessary to produce the FOMC's desired money growth.

[1]Free reserves (FR) are defined as excess reserves (ER) minus borrowed reserves (BR). Using the reserve accounting identities for excess reserves (ER) and nonborrowed reserves (NBR), it can be shown that free reserves are also identical to nonborrowed reserves minus required reserves (RR):

(1) FR = ER - BR Free reserves

(2) ER = TR - RR Excess reserves

(3) NBR = TR - BR Nonborrowed reserves

Substituting (2) and (3) into (1) yields

(4) FR = TR - RR - BR

= (TR - BR) - RR

= NBR - RR

When free reserves are negative—i.e., borrowed reserves exceed excess reserves—the term "net borrowed reserves" is used to refer to the difference between excess reserves and borrowed reserves.

When the FOMC targets nonborrowed reserves on a weekly basis, it is implicitly targeting free reserves, defined as nonborrowed reserves minus required reserves, because of the predetermination of required reserves that results from lagged reserve accounting. Such implicit free reserve targeting is designed to produce money market conditions necessary to achievement of the FOMC's desired monetary growth. This procedure differs importantly from that followed during the free reserve targeting era in the late 1950s and early 1960s. During that period free reserves were treated as an instrument for achieving the FOMC's ultimate economic policy objectives, but without specific regard to the behavior of the monetary aggregates. For a discussion of these earlier policies, see Peter Keir and and Henry Wallich, "The Role of Operating Guides in U.S. Monetary Policy: A Historical Review," *Federal Reserve Bulletin*, vol. 65 (September 1979), pp. 679-91.

[2]It has been suggested by some market analysts that this information lag should be reduced by the Federal Reserve through earlier release of aggregate data on borrowed reserves. Daily borrowing data could be made available on the next business day following the actual borrowing. When the FOMC was directly targeting the federal funds rate, the daily effective federal funds rate was available on each following day. In a sense, release of daily borrowing data with a one-day lag would be the logical analog under the current operating procedure.

[3]For additional discussion of this issue, see Peter D. Sternlight, et *al.*, "Monetary Policy and Open Market Operations in 1980," *Quarterly Review*, Federal Reserve Bank of New York (Summer 1981), pp. 64-65.

Concluding comments

The nonborrowed reserve targeting procedure adopted by the Fed on October 6, 1979, in conjunction with the existing lagged reserve accounting system, has increased the importance for monetary control of Federal Reserve discount policy and banks' demand for borrowed reserves. Given the weekly level of nonborrowed reserves, the federal funds rate depends critically on the level of the discount rate, the nonprice rationing criteria imposed at the discount window by the District Federal Reserve Banks, and other

Figure 3:
Under federal funds rate targeting, effect of increase in slope of borrowing function . . .

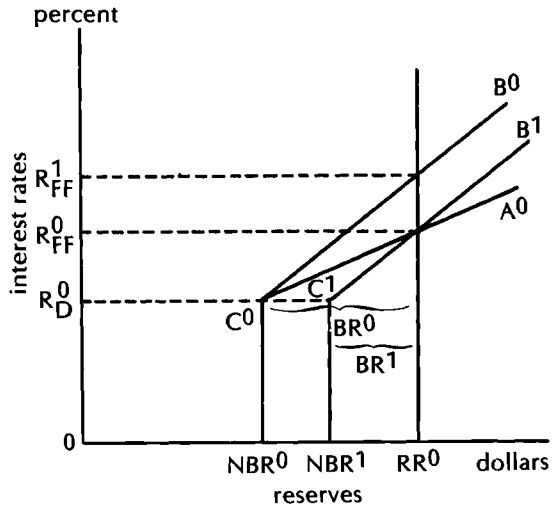
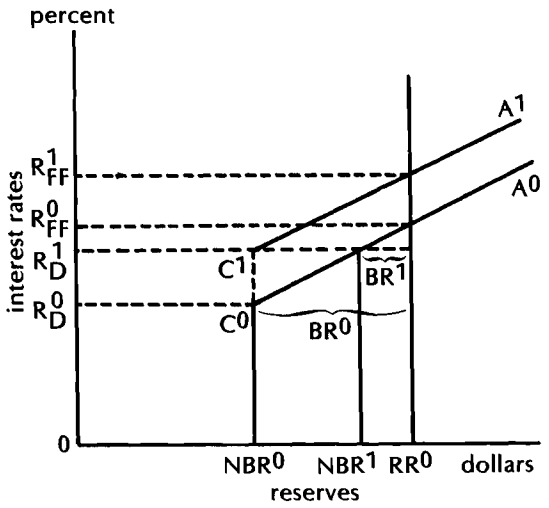


Figure 4:
. . . or of rise in discount rate is offset by increase in nonborrowed reserves



elements that enter into banks' demand for borrowed reserves (such as their expectations of future federal funds rate-discount rate spreads). The resulting federal funds rate plays a pivotal role in determining the money supply through its effect on banks' portfolio behavior. The less predictable is banks' demand for borrowed reserves, the less predictable is the money supply resulting from a given level of nonborrowed reserves.

Preliminary econometric estimations of the relationship between discount window reserve adjustment borrowing and the federal funds rate-discount rate spread indicate that this relationship became less stable after nonborrowed reserve targeting was adopted by the FOMC. (See box 1 for a summary of these preliminary econometric estimations.) One possible explanation for the decreased stability of the relationship between borrowed reserves and the federal funds rate-discount rate spread is the greater interest rate variability that has prevailed in the post-October 6, 1979 period.[10] To the degree that increased interest rate variability results in increased uncertainty about future federal funds rate-discount rate spreads, a given spread will elicit less discount window borrowing, all else remaining the same.

It has been suggested that the Fed's proposed return to some modified form of contemporaneous reserve accounting will again reduce the significance of discount policy. This reasoning is based in part on experience

[9]Notice that under a direct targeting procedure for the federal funds rate, an increase in the discount rate necessarily reduces the federal funds-discount rate spread, assuming no change in the federal funds rate target. This means that the intramarginal subsidy that accrues to banks that borrow from the Federal Reserve can be reduced. In contrast, if the Federal Reserve is adhering to a nonborrowed reserve target, an increase in the discount rate will, all else the same, have no effect on the federal funds rate-discount rate spread and, thus, the intramarginal subsidy. For a discussion of this "spread" issue see Paul L. Kasriel, "The Discount Rate—Will It Float?" *Economic Perspectives*, Federal Reserve Bank of Chicago (May/June 1981), pp. 20-23.

[10]For a discussion of some of the possible causes and potential social costs of increased interest rate variability in the post-October 6, 1979 period, see Paul L. Kasriel, "Interest Rate Volatility in 1980," *Economic Perspectives*, Federal Reserve Bank of Chicago (January/February 1981), pp. 8-11, 14-17.

prior to the adoption of lagged reserve accounting in 1968. However, both before 1968 and afterwards until 1979, the Fed employed a federal funds rate targeting procedure. Presumably, a move to contemporaneous reserve accounting as currently contemplated (i.e., with a two-day settlement lag; see footnote 1) would be accompanied by either a continuation of nonborrowed reserve targeting or total reserve targeting.

Achieving a total reserve target, in particular, would require a willingness on the part of the Fed to make borrowing for reserve adjustment purposes sufficiently costly on the last two days of the reserve settlement period that banks would adjust their portfolios earlier in the reserve settlement period to ensure that required reserves for the banking system would not exceed the FOMC's targeted level of total reserves. Without these high costs of borrowing toward the end of the settlement period, considerable slippage could occur in monetary control. In short, discount policy plays a key role in the monetary control process under any reserve targeting regime in which the reserve settlement period ends later than the reserve calculation period.