FRBSF ECONOMIC LETTER

Number 2002-30, October 11, 2002

# Setting the Interest Rate

The Federal Reserve's monetary policy goals are the maintenance of low inflation and sustainable output growth. Under current operating procedures, the Fed chooses a target for a short-term interest rate—specifically, the overnight federal funds rate, which is an overnight interbank lending rate—that is believed to be consistent with those policy goals.

To hit its interest rate target, the Fed relies primarily on open market operations—it buys and sells securities to adjust the supply of reserves available to depository institutions to meet their reserve requirements and to clear payments transactions. The Fed also can supply reserves by lending directly to depositories through the discount window. However, traditionally, banks have not used the discount window as a routine source of funding. Moreover, they have been reluctant to borrow at the window even during tight money market conditions, when the demand for reserves is exceptionally high, thus resulting in periodic spikes in the federal funds rate. The willingness of banks to make use of the discount window as a backup source of liquidity could change if the Fed were to adopt its recently proposed rule changes governing the administration of the discount window (Madigan and Nelson 2002). Under these rule changes, the Fed also would alter its operating procedures; it would effectively place a cap on the federal funds rate by standing ready to supply reserves on demand to qualified banks at that predetermined interest rate cap.

This *Economic Letter* describes key features of the Fed's current operating procedures for "setting" short-term market interest rates, indicates how the proposed rule changes for discount window borrowing affect the implementation of monetary policy, and outlines the economic benefits that are expected to accrue from the rule changes.

**Open market operations and market interest rates**

The Fed affects market interest rates by buying and selling securities in the open market. Most of those open market operations are temporary in that they consist of very short-maturity (usually overnight) repurchase agreements—repos or RPs—whereby the Fed acquires temporary ownership of U.S. government or U.S. government-agency securities, on which it receives a rate of return referred to as the repo or RP rate. The RP market is huge; some estimates are upwards of $500 billion in transactions per day (Stigum 1988). The Fed is a very small player in this market, with a typical daily transaction (if any) of $1–$3 billion. Therefore, its open market operations can have little direct effect on the equilibrium value of the RP rate.

Open market operations, however, do have a direct effect on the interest rate in the federal funds market. In this market, depository institutions actually trade the reserves they hold in Federal Reserve accounts, which are used: (along with vault cash on hand) to meet reserve requirements, for check-clearing and other settlement of interbank transactions, and for payment to the Fed for financial services rendered. By settling its transactions involving RPs with bank reserves, the Fed essentially determines the supply of reserves in the banking system and thereby exercises significant control over the federal funds rate. Therefore, when Fed policy targets a market interest rate, it targets the federal funds rate.

Why do movements in the federal funds rate influence the RP rate and other short-term market rates? Suppose a commercial bank wants to raise overnight funds on short notice. It might borrow reserves in the federal funds market, or it might sell securities "under repo." In the former case, the bank borrows at the federal funds rate; in the latter case, it borrows at the RP rate. Because there are only minor differences in the quality of the two assets, their rates remain very closely tied together due to the elimination of arbitrage opportunities that would otherwise exist for banks who participate in both markets. Similarly, other short-term money market interest rates respond in kind in order to maintain a portfolio balance under which all assets yield the same expected return after adjusting for risk, maturity, and liquidity differences. Hence, when the Fed adjusts its target for the federal funds rate, all other short-term interest rates tend to move with it. Indeed, some short-term interest rates may change in anticipation of the change in the target.

**Controlling the federal funds rate**

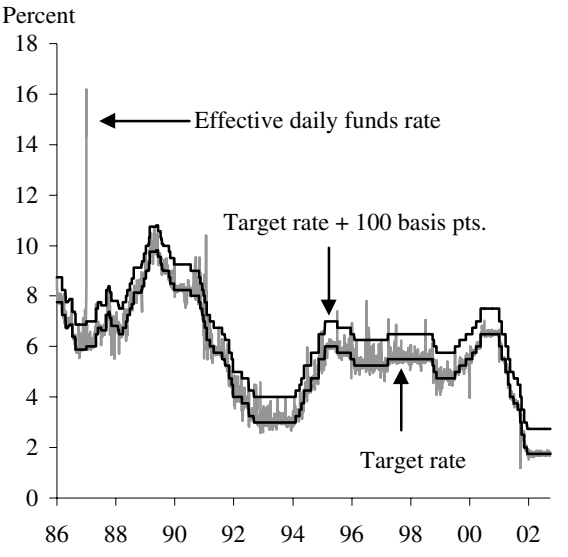
Over time, the Fed can hit its interest rate target on average. The degree of control that it exercises over the federal funds rate in the very short run, however, is limited. Figure 1 shows the short-run volatility in the average daily federal funds rate, which reflects several features of the market. In recent years, the Fed has restricted its (temporary) open market operations to one intervention per day (if at all). The size of this intervention corresponds to the anticipated reserves need of depositories. However, actual supply and demand for reserves can differ from what is anticipated. Shocks to banks' demand for federal funds arrive throughout the day, while daily shocks to the supply of federal funds originate with unanticipated changes in Treasury balances maintained at the Fed, along with changes in banks' demands for currency. To the extent that these demand and supply shocks are not completely offset by open market operations, the federal funds rate will deviate from its target. The larger and more frequent are the shocks relative to the overall volume of bank reserves, the greater is the volatility in the federal funds rate (Hamilton 1996, Furfine 1997, and Bartolini, et al. 2002).

Factors that influence how responsive the federal funds rate is to shocks include the relative importance that banks attach to various functions that bank reserves perform, along with the opportunity cost, or lost interest income, that banks incur from holding positive reserve balances, which are legislated to be non-interest bearing. Currently, most banks must hold reserves in the form of vault cash and deposits at the Fed as a certain percentage of their checkable deposit account liabilities. These requirements must be met on average over a two-week reserve maintenance period, with allowance for some carry-forward provisions (Feinman 1993). The final day for adjusting reserves to meet required reserves is known as "bank settlement day" and is normally characterized by heightened activity in the federal funds market (Clouse and Dow 2002).

Banks face a modest penalty for intraday overdrafts on their reserve accounts (Coleman 2002) and a very stiff penalty on overnight overdrafts (400 basis points above the market rate). Avoiding overnight overdrafts can be difficult for banks, since they do not have full control over the timing and magnitude of outflows from their reserve accounts that are required to settle transactions. This unpredictability gives rise to a precautionary demand for reserves. Banks also may *voluntarily* agree to hold what are (perhaps, unfortunately) termed "required clearing balances" at the Fed on which they earn an implicit

**Figure 1**

**Effective daily federal funds rate and target rate**




interest rate in the form of "earnings credits" that can be applied toward the purchase of the Fed's financial services, such as check-clearing. The demand for required clearing balances is generally limited by the volume of services purchased and is less interest-sensitive than the precautionary holdings. Failure to maintain the committed required clearing balances also may result in both pecuniary and nonpecuniary penalties (Clouse and Elmendorf 1997).

**The discount window rule changes**

Currently, eligible depository institutions can borrow directly from the Fed's discount window to meet short-term unanticipated liquidity needs. One category of these (collateralized) loans, termed "adjustment credit," comprises loans that are usually overnight in maturity and are made at an administered interest rate, termed the discount rate. However, for reasons described below, banks make only limited use of the discount window for adjustment credit borrowing. The discount window also is used for seasonal borrowings, mostly associated with agricultural production loans, and for "extended credit" for banks with longer-maturity liquidity needs resulting from exceptional circumstances.

Under current operating procedures, the discount rate normally lies 25 to 50 basis points *below* the federal funds rate. To prevent banks from trying to exploit the spread between the federal funds rate and the discount rate, the Fed requires that banks present a need for funds that is appropriate to the discount facilities' intent (Clouse 1994). For example, a discount window loan would not be granted

to enable a bank to conclude planned investment or loan opportunities. In addition, banks are expected to have exhausted all other reasonable sources of credit before borrowing from the window and should expect to face greater regulatory scrutiny if they borrow at the window too often. Due to these nonpecuniary costs, many banks have become reluctant to borrow at the discount window for adjustment credit, concerned over a perceived "negative signal" that this action would send. Currently, the volume of borrowed reserves is less than 1% of total reserves.

An important change in the administration of the discount window that is being proposed by the Fed is to set the discount rate *above* the federal funds rate target. This could allow for more reliance on explicit market pricing to determine the volume of discount window borrowing and remove the perceived stigma to borrowing. That is, eligibility requirements would be streamlined and rendered consistent with reliance on the discount window as a relatively unfettered source of liquidity for financially sound banks during tight money market conditions that would otherwise result in a spike in the federal funds rate.

The initial proposal sets this cap at 100 basis points above the federal funds rate target. As suggested by Figure 1, historically, this cap would have been breached by the average daily federal funds rate only about 1% of the time, with roughly half of those days coming on bank settlement days. However, the frequency with which individual trades throughout the day would have exceeded the cap is significantly higher. For example, the closing federal funds rate would have exceeded this cap approximately 4% of the time. As banks adjust their reserve management practices under the new operating procedures, this cap could become binding more frequently than history would suggest. In any case, the average daily cost of federal funds to banks should be reduced and the federal funds rate should remain closer to the Fed's target.

This rule change is expected to have several benefits. First, providing a cap on the federal funds rate by endogenously supplying reserves to meet high periods of demand should reduce interest rate volatility. This may become more significant as continual financial innovation would otherwise further reduce banks' required reserves and render the demand for reserves more interest inelastic, as required clearing balances assume a larger share of the total demand for reserves (Clouse and Elmendorf 1997). Second, the simplification of discount window borrowing procedures should lead to reduced administrative costs. Third, these simplifications also will help clarify the intent of individual discount window regulatory decisions, since less subjective assessment is required. Finally, monetary policy could be rendered more effective, to the extent that the discount rate can become a tool for capping the federal funds rate. This cap can be adjusted to keep the federal funds rate close to the target value, where "close" is determined as a matter of monetary policy decisions that reflect current market conditions.

**Milton Marquis**
**Senior Economist**

**References**

Bartolini, Leonardo, Giuseppe Bertola, and Alessandro Prati. 2002. "Day-to-Day Monetary Policy and Volatility of the Federal Funds Rate." *Journal of Money, Credit and Banking* 34(1) (February) pp. 137–159.

Clouse, James A. 1994. "Recent Developments in Discount Window Policy." *Federal Reserve Bulletin* 80(11) (November) pp. 965–977.

Clouse, James A., and James P. Dow, Jr. 2002. "A Computational Model of Banks' Optimal Reserve Management Policy." *Journal of Economic Dynamics and Control* 26(11) (September) pp. 1,787–1,814.

Clouse, James A., and Douglas W. Elemendorf. 1997. "Declining Required Reserves and the Volatility of the Federal Funds Rate." *Finance and Economics Discussion Series* 1997-30 (June) Board of Governors of the Federal Reserve.

Coleman, Stacy P. 2002. "The Evolution of the Federal Reserve's Intraday Credit Policies." *Federal Reserve Bulletin* 88 (February) pp. 67–84.

Feinman, Joshua. 1993. "Estimating the Open Market Desk's Daily Reaction Function." *Journal of Money, Credit and Banking* 25 (May) pp. 231–247.

Furfine, Craig. 2000. "Interbank Payments and the Daily Federal Funds Rate." *Journal of Monetary Economics* 46, pp. 535–553.

Hamilton, James. 1996. "The Daily Market in Federal Funds." *Journal of Political Economy* 104, pp. 26–56.

Madigan, Brian, and William Nelson. 2002. "Proposed Revision to the Federal Reserve's Discount Window Lending Programs." *Federal Reserve Bulletin* 88(7) (July) pp. 313–319.

Stigum, Marcia. 1988. *After the Trade.* Homewood, IL: Dow-Jones Irwin.

ECONOMIC RESEARCH

FEDERAL RESERVE BANK

OF SAN FRANCISCO

P.O. Box 7702
San Francisco, CA 94120
**Address Service Requested**





**Index to Recent Issues of *FRBSF Economic Letter***

| DATE | NUMBER | TITLE | AUTHOR |
|---|---|---|---|
| 4/19 | 02-11 | Macroeconomic Models for Monetary Policy | Rudebusch/Wu |
| 4/26 | 02-12 | Is There a Credit Crunch? | Kwan |
| 5/3 | 02-13 | House Price Dynamics and the Business Cycle | Krainer |
| 5/10 | 02-14 | Deposit Insurance Reform—When Half a Loaf Is Better | Furlong/Kwan |
| 5/17 | 02-15 | Off-Site Monitoring of Bank Holding Companies | Krainer/Lopez |
| 5/24 | 02-16 | Searching for Value in the U.S. Stock Market | Lansing |
| 5/31 | 02-17 | Reforming China's Banking System | Moreno |
| 6/14 | 02-18 | Country Crises and Corporate Failures: Lessons for Prevention... | Glick |
| 6/28 | 02-19 | Towards a Sovereign Debt Restructuring Mechanism | Spiegel |
| 7/5 | 02-20 | Productivity in Heart Attack Treatments | Gowrisankaran |
| 7/26 | 02-21 | Trends in the Concentration of Bank Deposits: The Northwest | Laderman |
| 8/2 | 02-22 | Using Chain-Weighted NIPA Data | Jones |
| 8/9 | 02-23 | Technical Change and the Dispersion of Wages | Trehan |
| 8/16 | 02-24 | On the Move: California Employment Law and High-Tech Development | Valletta |
| 8/23 | 02-25 | Argentina's Currency Crisis: Lessons for Asia | Spiegel |
| 9/06 | 02-26 | The Role of Fiscal Policy | Walsh |
| 9/20 | 02-27 | Why Do Americans Still Write Checks? | Gowrisankaran |
| 9/27 | 02-28 | Japan Passes Again on Fundamental Financial Reform | Cargill |
| 10/4 | 02-29 | Can the Phillips Curve Help Forecast Inflation? | Lansing |

Opinions expressed in the *Economic Letter* do not necessarily reflect the views of the management of the Federal Reserve Bank of San Francisco or of the Board of Governors of the Federal Reserve System. This publication is edited by Judith Goff, with the assistance of Anita Todd. Permission to reprint portions of articles or whole articles must be obtained in writing. Permission to photocopy is unrestricted. Please send editorial comments and requests for subscriptions, back copies, address changes, and reprint permission to: Public Information Department, Federal Reserve Bank of San Francisco, P.O. Box 7702, San Francisco, CA 94120, phone (415) 974-2163, fax (415) 974-3341, e-mail sf.pubs@sf.frb.org. **The *Economic Letter* and other publications and information are available on our website, http://www.frbsf.org.**