

Implementing US monetary policy with low reserve requirements

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Introduction

Reserve requirements in the United States have fallen to very low levels and are becoming less of a binding constraint on the amount of balances banks maintain in their Federal Reserve accounts. Most recently, so-called sweep account arrangements, which automatically shift customer funds out of reservable liabilities at the end of a business day, have been behind the trend toward lower required reserve balances. A few years ago, US banks' use of Federal Reserve discount facilities for meeting temporary liquidity needs declined noticeably, a situation that persists. This set of circumstances raises issues about potential volatility in short-term dollar interest rates.

1. Background: structures of reserve requirements and reserve accounts

Reserve requirements are computed for banks and other depository institutions as a percent of certain deposit liabilities. For large banks, reserve ratio requirements currently equal ten percent of "transaction" deposits (i.e. demand deposit and checking accounts) at the margin.² The Federal Reserve collects information on banks' deposits for two-week holding periods, and banks must hold the corresponding amount of reserves contemporaneously.³

Figure 1 shows the structure of bank reserves and the balances banks keep in their accounts at the Federal Reserve. Reserve requirements may be satisfied with a combination of vault cash and Fed account balances. As the chart shows, nearly two-thirds of reserve requirements in the middle of 1996 were fulfilled with vault cash, and the remainder with reserve balances.

The account balances also include excess reserves (i.e. reserves in excess of requirements), as well as required clearing balances. The latter are balances that banks have contracted to maintain and on which they receive implicit interest credits that may be used to pay for Federal Reserve services such as check clearing, money transfers, or securities settlements. Required clearing balances are not included in the calculation of reserves *per se*. But because banks commit themselves in advance to holding these minimum clearing balance levels, during a reserve maintenance period they function analogously to reserve requirements.

All reserve requirements and account balance figures pertain to end-of-day amounts; during the day the banks may use the funds freely for transactions. Thus, when a bank's reserve requirements are met completely by vault cash, it typically will still choose to hold some Fed account balances for transactions purposes during the day, and at the end of the day in the form of clearing

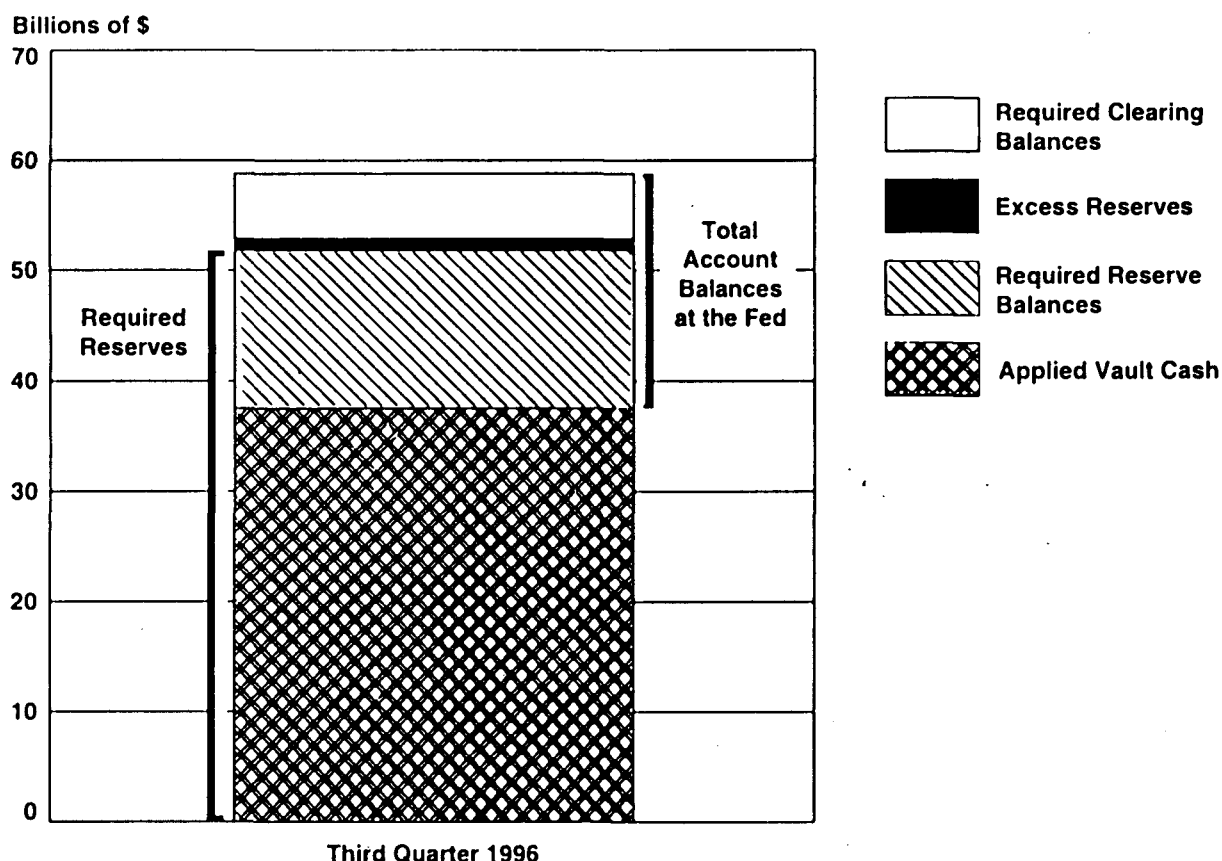
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² This is a simplified explanation of current reserve requirements; more detail is shown in Figure 2 in this paper. See also the *Federal Reserve Bulletin*, Table 1.15, "Reserve Requirements of Depository Institutions."

³ More precisely, reserve balance requirements for a given two-week reserve maintenance period are based upon deposits during the corresponding two-week period that ends two days earlier. Vault cash is applied against reserve requirements with a two-week lag.

balances or excess reserves. In addition, most institutions are permitted to run overdrafts during the day. Overnight, however, Fed accounts may not be in overdraft (i.e. overdrafts are penalized), and institutions occasionally borrow from the Federal Reserve's discount window to cover such shortfalls.

Figure 1
Components of reserves and account balances at the Fed



2. Trends in reserve requirements and reserve account balances

Required reserve ratios have been declining over time, and so have required balance holdings at the Fed. As Table 1 reflects, the ratio requirements on time deposits (including large certificates of deposit and net eurodollar liabilities) were set to zero near the end of 1990. These requirements on large deposits had made bank lending less competitive with other wholesale sources of funds such as commercial paper. Remaining requirements are against transaction accounts, which typically pay zero or low rates of interest and have high turnover velocities. In April 1992 the reserve ratio requirement for transactions deposits was reduced from 12 to 10%.

In dollar terms, reserves have been on a pronounced downward trend since 1993 (Figure 2). Nevertheless, vault cash applied against reserve requirements has continued to rise, apparently reflecting the growth in automatic teller machines. Accordingly, the portion of the requirement that must be fulfilled with balances in banks' Federal Reserve accounts has been squeezed down between the lower total requirements and the growing vault cash. Since the late 1980s banks have increased the amounts of clearing balances they commit to hold, in order to earn implicit interest on balances in excess of their requirements. Nevertheless, total account balances, including required clearing balances, have declined for the past three years.

Table 1
Reserves requirements of depository institutions

1976 ¹		1986 ²		1996 ³	
Type of deposits	Requirement (% of deposits)	Type of deposits	Requirement (% of deposits)	Type of deposits	Requirement (% of deposits)
Net demand		Net transaction accounts		Net transaction accounts	
\$0 - 2 million	7.5%	\$0 - 31.7 million	3%	\$0 - 52 million	3%
\$2 - 10 million	10	More than \$31.7 million	12	More than \$52 million	10
\$10 - 100 million	12	Non-personal time deposits			
\$100 - 400 million	13	Less than 15 years	3		
Over \$400 million	16.5	Eurocurrency liabilities			
Time and Savings		All types	3		
Savings	3				
Time					
\$0 - 5 million by maturity					
30 - 179 days	3				
180 days to 4 years	2.5				
4 years or more	1				
Over \$5 million by maturity					
30 - 179 days	6				
180 days to 4 years	2.5				
4 years or more	1				

¹ As of December 1976. ² As of December 1986. ³ As of August 1996.

These trends have affected both small and large banks (Figures 3 and 4).⁴ The clearest difference between the two categories is in their holdings of excess reserves. Historically, many small commercial banks and other depository institutions have fulfilled their reserve requirements entirely by vault cash, and, therefore, such institutions have held higher amounts of excess reserves and clearing balances.⁵ Large banks, by contrast, have kept excess reserves at very low levels.

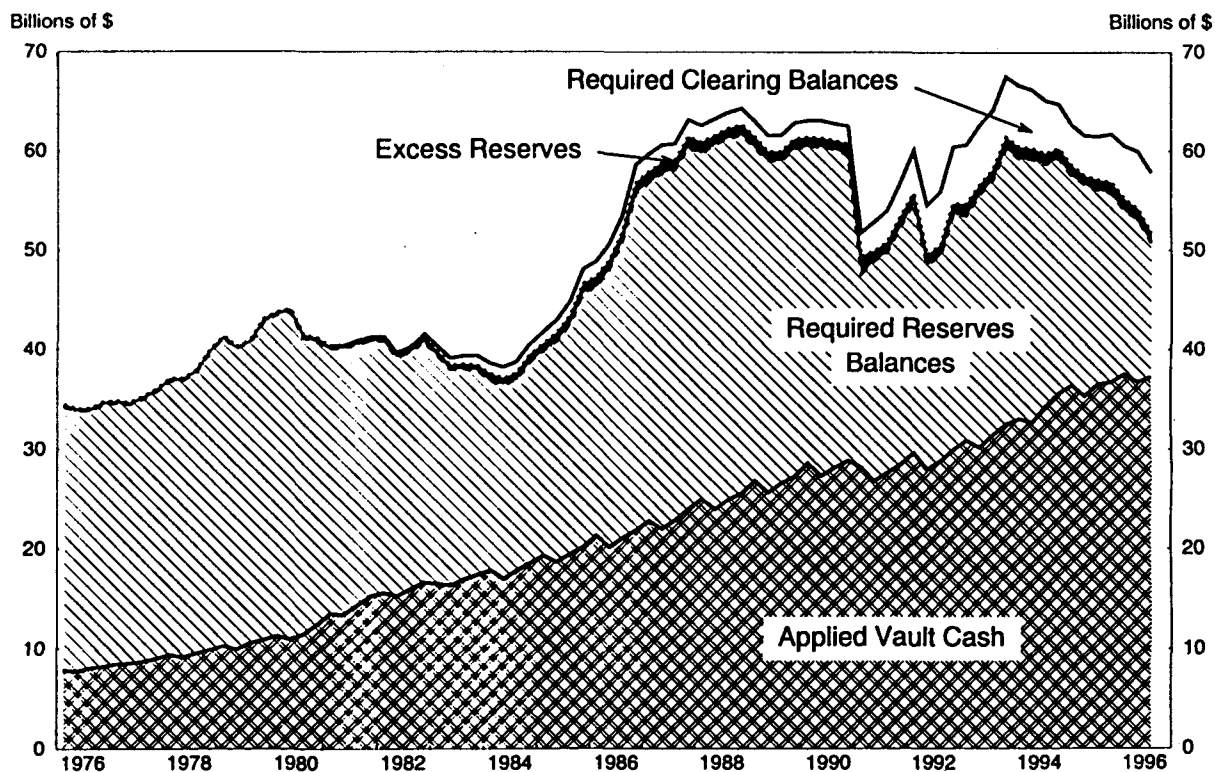
Another difference between large and small banks has been in the pattern of their usage of required clearing balances. While the use of clearing balances has increased on the part of smaller banks, among large banks the rise has been proportionately more striking. Prior to 1990 large banks held only very small amounts of these clearing balances but increased the amounts to over \$3 billion by the middle of 1993. Since the credits earned on clearing balances are useful only to pay for Federal

⁴ The "large" category includes a group of approximately 140 large commercial banks and large thrift institutions. The "small" category contains all other depository institutions.

⁵ As of the 25th March, 1996, there were 9,095 so-called "non-bound" depository institutions, defined as those with vault cash equal to or greater than their reserve requirements; another 3,141 institutions needed to hold positive reserve account balances to meet their requirements.

Reserve service charges, however, the growth of such balances is intrinsically limited. Since 1993, clearing balance levels for both large and small banks have gone down and come back up, but not increased on a net basis.

Figure 2
Components of reserves and account balances at the Fed



As Table 2 illustrates, reserve requirements are beginning to bind less. Through the middle of 1993, virtually all the larger banks were "bound" institutions, i.e. they needed to hold balances at the Fed to complete their reserve requirements. "Non-bound" large banks – large banks meeting all their requirements with vault cash and thus having no required reserve balances in their Fed accounts – were a rarity. After 1993, however, this changed, due largely to the growth of sweep account, as described below. By the 3rd quarter 1996, large banks with required reserves totaling \$5.7 billion had become unbound. As Table 2 shows, the required reserve balances at the Fed for the large banks category had fallen by the 3rd quarter 1996 to \$7.5 billion, less than half its 1990 level. Required balances at the small banks also fell, only slightly less dramatically.

Figure 3
 Components of reserves and account balances held by small sized institutions

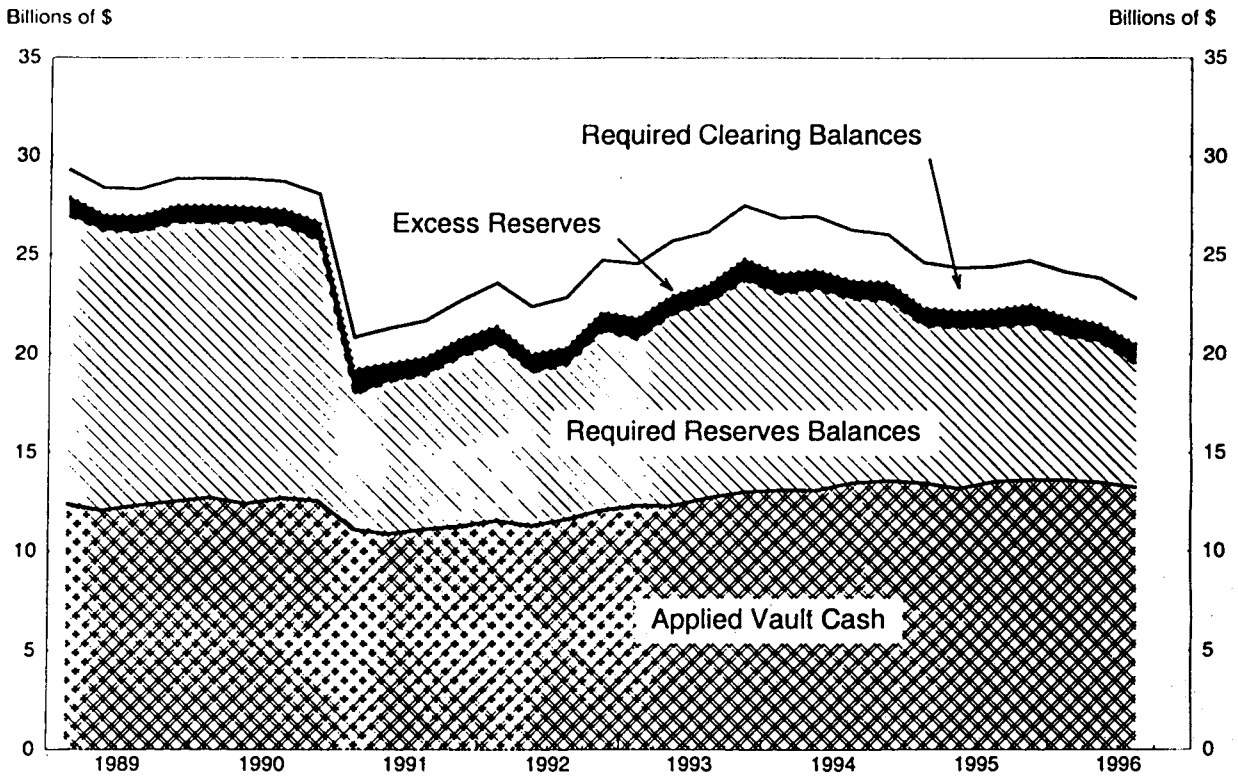


Figure 4
 Components of reserves and account balances held by large sized institutions

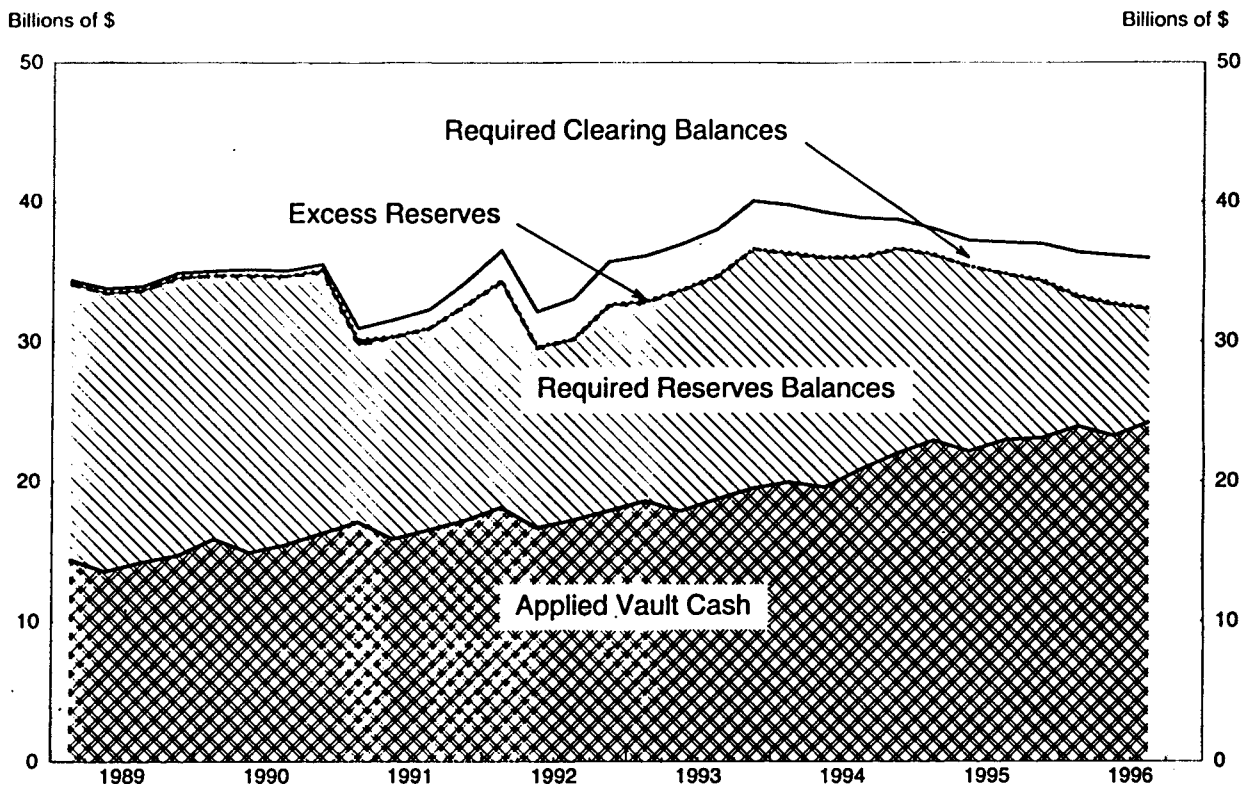


Table 2
Reserve positions of small and large depository institutions
 Billions of US dollars

	Total			Bound ¹			Non-bound ¹		
	1990 Q3	1993 Q3	1996 Q3	1990 Q3	1993 Q3	1996 Q3	1990 Q3	1993 Q3	1996 Q3
Required reserves									
Large banks	34.7	34.5	31.5	34.5	34.4	25.9	0.2	0.1	5.6
Small banks	25.4	22.7	19.2	22.1	19.2	13.5	3.3	3.5	5.7
Applied vault cash									
Large banks	15.4	18.7	24.0	15.2	18.6	18.4	0.2	0.1	5.6
Small banks	12.7	12.8	13.1	9.4	9.3	7.4	3.3	3.5	5.7
Required reserve balances²									
Large banks	19.3	15.8	7.5	19.3	15.8	7.5	0	0	0
Small banks	12.7	9.9	6.1	12.7	9.9	6.1	0	0	0

Note: "Banks" here refer to commercial banks and thrift institutions. See also footnote 3 in the text regarding the size breakout.

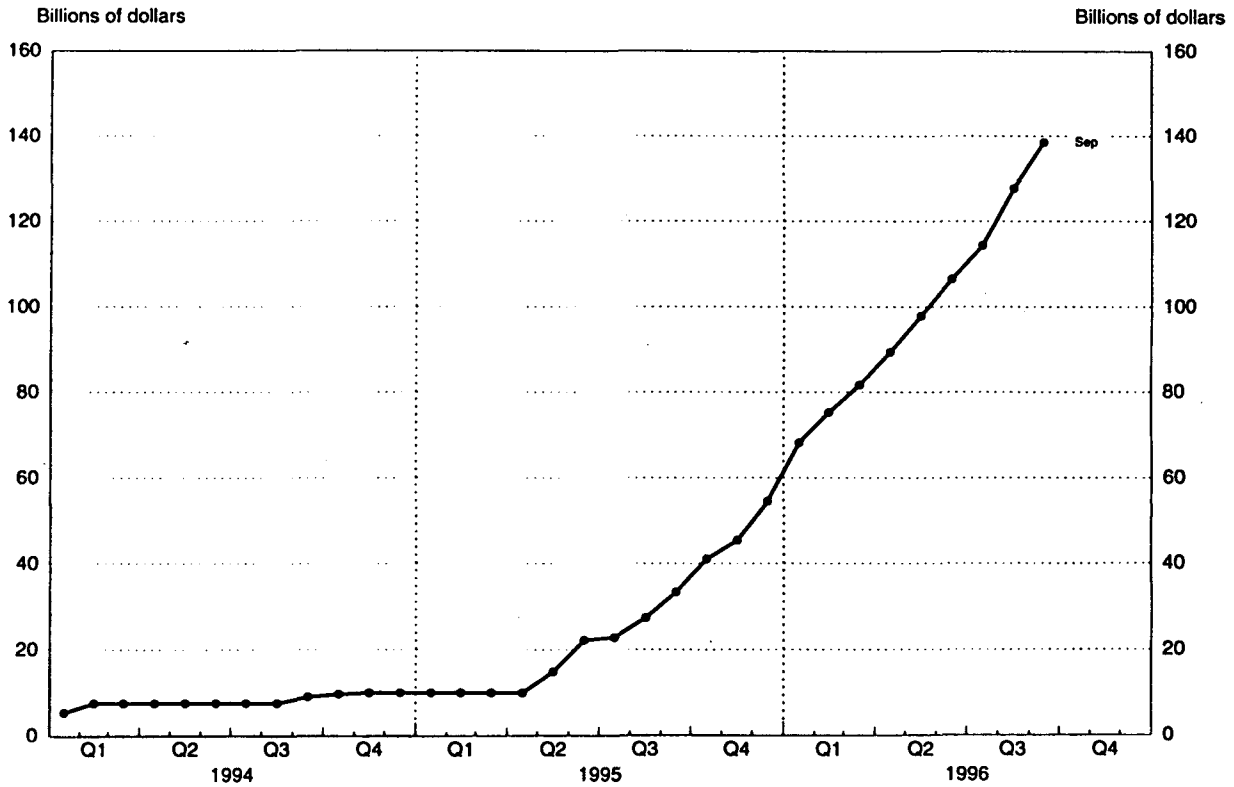
¹ "Bound" institutions are those for whom their reserve requirements exceed their vault cash and, therefore, represent a requirement applying to their Federal Reserve account balances. "Non-bound" institutions have vault cash holdings equal to or exceeding their reserve requirements, and hence have "applied vault cash" exactly equal to their reserve requirements. ² Excludes required clearing balances.

3. Sweep accounts

While the lowering of requirements on wholesale funding sources had a major impact on required reserves in 1990-91, in the past three years another important factor has emerged in the form of retail "sweep" account arrangements. Sweep arrangements move funds out of transactions accounts at the end of day, to be held overnight in savings accounts that incur no reserve requirements. Depending on the specifics of the arrangements, funds may potentially be swept on a daily basis or over weekends and holidays. The depositor retains the ability to fully utilize the account balances to make payments or withdrawals, yet the bank lowers its reserve requirement. In varying forms, sweep arrangements have existed for business depositors since the 1970s, but the rapidly growing application to retail accounts is new.

While precise figures are not available, estimates indicate that the effect of the recent growth in sweep accounts has been very substantial. The Federal Reserve does not collect regular statistics on the outstanding amounts of sweep arrangements. But since 1994 we have kept track of when such arrangements have been implemented at banks, and we have also kept track of the amounts of deposits affected at the start of each bank's program. Cumulating these initial amounts gives at least a rough indication of their growth, although the methodology fails to account for changes in swept balances after programs are underway. Figure 5 plots the cumulative initial sweep account balances.

Figure 5
Sweeps of retail transaction deposits into MMDAs*



* Monthly figures are the accumulated estimates of total transaction account balances initially swept into MMDAs owing to the introduction of new sweep programs.

As of the 3rd quarter 1996, the cumulated initial balances method implies that nearly \$130 billion of transactions balances that would otherwise incur reserve requirements were being swept into savings accounts; moreover, the amount of sweeps being implemented was continuing to grow very rapidly. At current reserve ratio requirements this implies that the spread of sweeps has reduced required reserves by nearly \$13 billion since the beginning of 1994. By comparison, during the three-year period ending in mid-1996, required reserve balances fell by \$11.2 billion (Table 3); thus sweep arrangements appear to be a key factor accounting for the recent drop in required reserve balances.

Table 3
Composition of federal reserves accounts
Billions of US dollars

	1990 Q3	1993 Q3	1996 Q3
Sum of account balances plus applied vault cash.....	62.8	64.2	58.8
Applied vault cash	28.1	31.4	37.2
Account balances at the Fed	34.7	32.8	21.6
Required reserve balances.....	32.0	25.8	14.6
Required clearing balances	1.8	6.0	6.0
<i>Subtotal: required balances</i>	<i>33.8</i>	<i>31.8</i>	<i>20.6</i>
Excess reserves	0.9	1.0	1.0

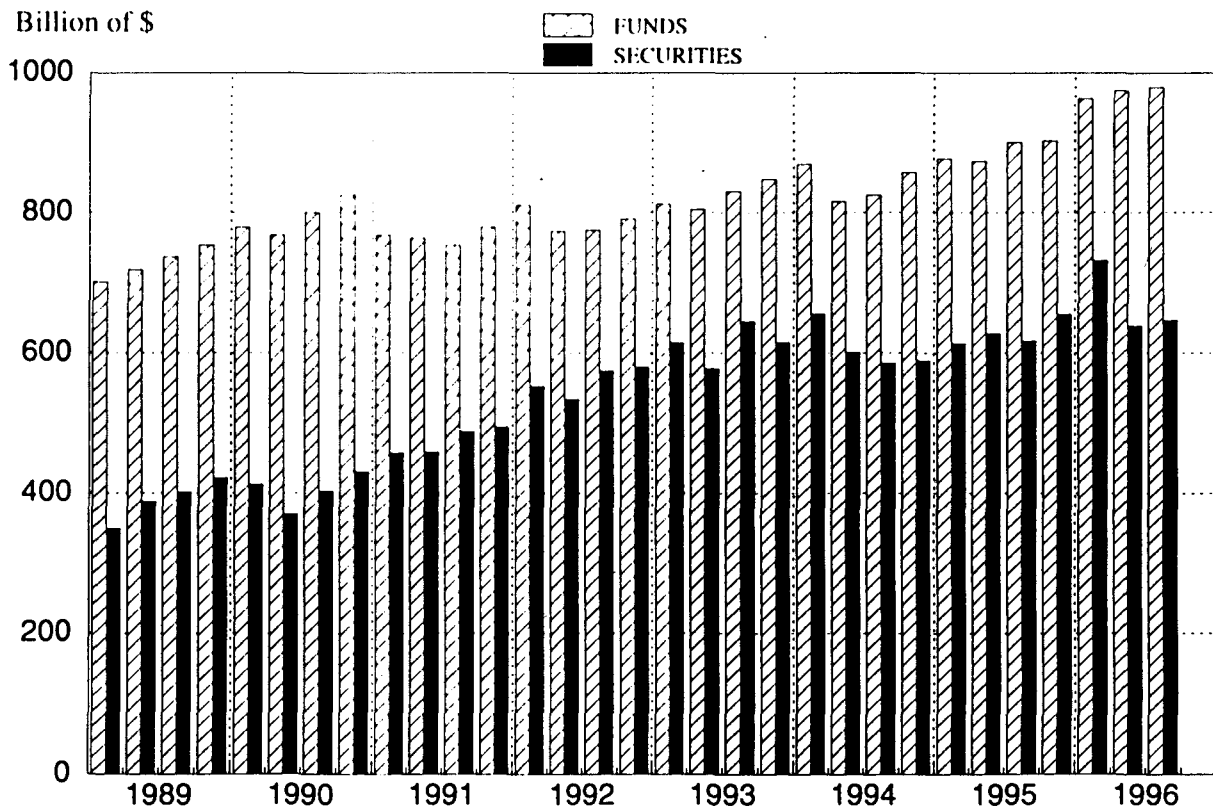
An \$11.2 billion drop may appear small relative to the overall size of the money markets or bank liabilities, but operationally it is highly significant because of its size relative to the total amounts of reserve account balances. By the 3rd quarter 1996 the total of required reserve and clearing balances was \$20.6 billion, and this figure has been continuing to decline. As required balances have fallen, excess reserves have remained in the neighborhood of \$1 billion, consistent with requirements remaining binding at many institutions. Nevertheless, if such large declines in required reserves were to continue, in principle they could cease to bind at many more banks, barring other developments.

4. Payments-related demand for account balances

Reserve account balances held at the end of the day are counted towards meeting reserve requirements. But credits and debits to banks' reserve accounts are also used extensively throughout the day as a means of final settlement for business and banking transactions, creating an additional source of demand for reserve balances. Partly for this reason, reserve pressures often arise on days when transactions flows are particularly heavy, even when reserve balances appear more than adequate for banks to meet their reserve requirements.

Reserve balance requirements will be binding as long as they exceed the amount of balances banks would choose to hold for transactions purposes. The latter amount, in principle, may change for several reasons, such as transactions costs, the cost of overdrafting the account during or at the end of the day, and the uncertainty of the flow of debits and credits to the account during the day. In the presence of reserve requirements, the balances banks would have chosen to hold in their absence are unobservable, but some inferences, nonetheless, can be drawn concerning the basic trends in the balances needed to support payments activities.

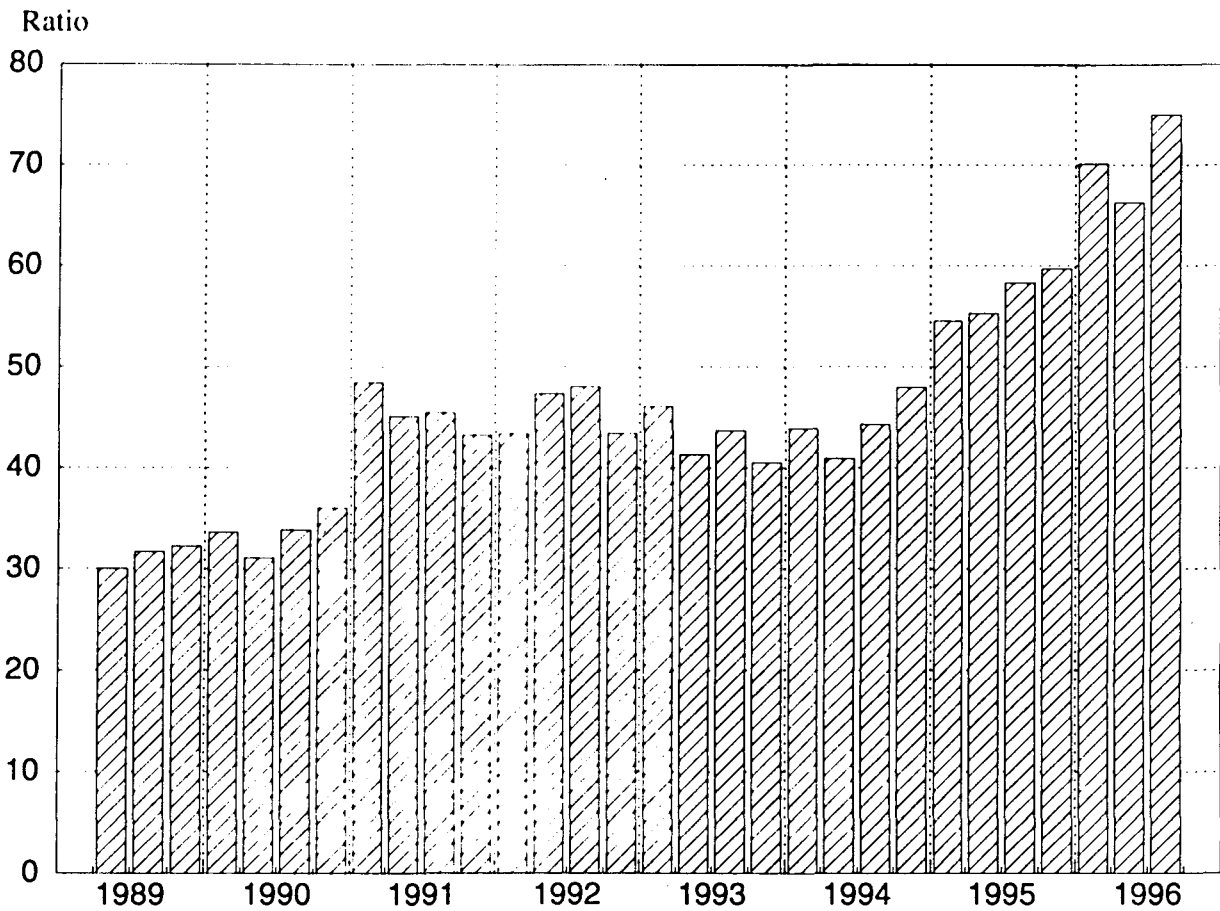
Figure 6
Average daily value of Fedwire transfers



For the most part, the trends have been in the direction of lowering the amount of reserves that banks need to carry out a given flow of transactions. One factor allowing this has been banks' improved ability to monitor their reserve account positions during the day. For example, in the first part of the 1980s the Federal Reserve made available computer screens to banks allowing them to track the effects of money and securities transfers on their Fed accounts, but these did not become fully effective as account balance monitoring tools until the early 1990s when virtually all debits and credits began to be entered into the real-time intraday totals transmitted to banks. This information makes it possible for banks to manage their accounts better and to control end-of-day balances more accurately.

Indeed, as Figure 6 shows, the dollar volume of large payments running through Federal Reserve accounts has continued to grow, albeit modestly in recent years, even as total reserve balances have fallen, placing greater demands on the remaining balances. This is also illustrated in Figure 7, which plots the ratio of dollar transactions to aggregate end-of-day balances. On balance, the marked increase in transactions flows relative to end-of-day balances since 1993 suggests that banks have been closing the gap between the balances required by regulation and their demands for balances to carry out payments.

Figure 7
Ratio of total payments to reserve account balances*



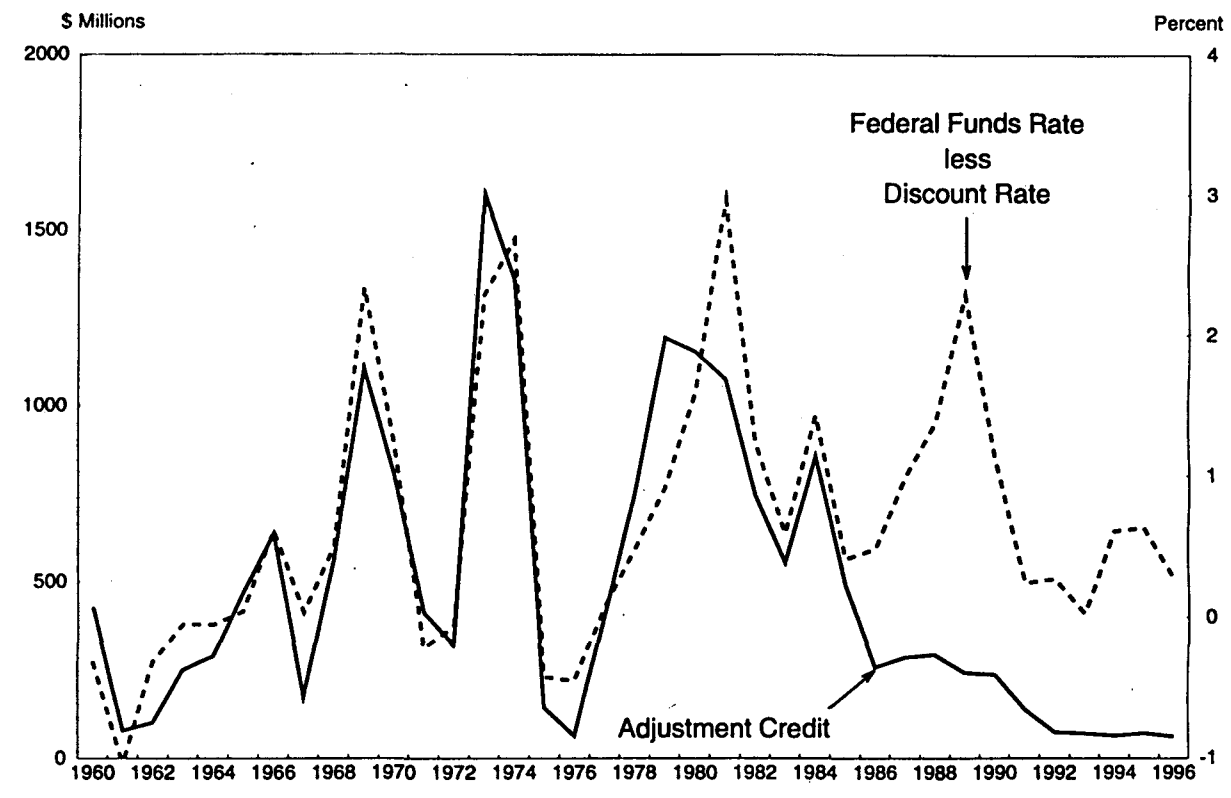
* Average daily Fedwire funds and securities-related transfers in dollars, divided by average daily end-of-day balances at the Fed.

5. Federal reserve credit

In recent years, banks have appeared less willing to borrow from the Federal Reserve's discount window.⁶ Typical reasons for borrowing are to offset temporary shortfalls in reserve accounts, as when funds are badly distributed in the market, or when computer problems at a bank or its counterparties create imbalances. Although the interest rate charged on discount loans is usually set below rates in the interbank market, the Federal Reserve rations the frequency of borrowings and requires collateral for loans. Banks are encouraged to actively seek funds in the market before coming to the Fed. Historically, the amount of borrowing has been systematically related to the spread between the discount rate and the federal funds rate, both because a high federal funds rate may reflect a tight, difficult market and because of strategic behavior by banks seeking to lower funding costs.

Since the mid 1980s, the historical relationship between borrowings and the spread has broken down, as is clear in Figure 8. An explanation in the 1980s was that banks feared that borrowing would identify them as having funding problems, at a time when bank failures were high. The continuation of this hesitancy to make use of the discount window is not completely understood, but it may be that some of the stigma associated with discount borrowing has not entirely gone.⁷

Figure 8
Adjustment borrowing and the spread of the federal funds rate over the discount rate



⁶ In addition to discount window credit, which takes the form of 24-hour loans, the Federal Reserve also extends credit in the form of intraday overdrafts. In the latter 1980s and early 1990s a series of policies were implemented placing caps on the amount of intraday credit to depository institutions and implementing minute-by-minute pricing of account overdrafts. The net effect of the policies has been to discourage overdrafts during the day. In principle, this might also reduce the incidence of end-of-day overdrafts or borrowings, although little hard evidence exists on the effects of lower intraday overdrafts on end-of-day accounts. It should also be noted that the Federal Reserve imposes a penalty rate on overnight overdrafts not funded with discount borrowings, such as might occur when a bank receives an unexpected debit to its account after personnel authorized to borrow have gone home for the night.

⁷ Thirty-four of fifty respondents to the Federal Reserve's May 1996 Survey of Senior Loan Officers indicated that such concerns continued to play at least some role in their decisions to seek discount window credit.

In principle, other factors equal, a hesitancy to borrow from the discount window would increase the amount of end-of-day account balances banks would target, in order to reduce the likelihood of needing to borrow. Similarly, in principle, Federal Reserve policies to limit account overdrafts during the day might increase expected end-of-day account balances and reduce the probability of overnight discount window borrowings. In practice, however, the decline in reserve requirements and the improved account balance monitoring capabilities have been more dominant factors, reducing end-of-day balances.⁸

Nevertheless, the hesitancy of banks to borrow from the discount window might become more important if reserves continue to fall dramatically, for such borrowings buffer unanticipated shocks to account balances. If banks hesitate to borrow from the Fed, then their need to borrow from market sources on a given day might become more urgent, possibly affecting overnight interest rates. Certainly, on the final day of reserve holding periods it has been commonplace for there to be relatively large swings in the federal funds rate.

6. Potential volatility

Low reserve requirements lower the intertemporal substitutability of reserve account balances within a maintenance period, possibly contributing to increased volatility in overnight interest rates for immediately available reserve balances. As average reserve account balances fall, the likelihood increases that random variations in the flow of payments would push account balances into negative territory on a given day. Unlike shortfalls from the level of required reserves, which can be made up during the remainder of a reserve maintenance period, a reserve balance shortfall must be made up by the end of a business day. A bank unexpectedly in overdraft near the end of a day would then have to quickly seek funds in the market.

Conversely, low reserve requirements also reduce the willingness of banks to accept large surplus reserve positions at the end of any day. A bank trying to offset a large surplus position on one day by holding lower balances over the remaining days of a reserve accounting period faces an increased risk of incurring an end-of-day overdraft when reserve levels are low. Not only do lower required reserve balances reduce the ability of an individual institution to absorb unexpected reserve surpluses or deficiencies from its level of requirements, but at the same time – and for the same reasons – other institutions have reduced flexibility to act as counterparties to those attempting to make such adjustments.

This can lead to volatility in the federal funds rate. If a bank with a reserve shortfall that must be covered is able to easily identify institutions with offsetting surplus positions, then the funding markets should be able to clear without increased pressure on interest rates. However, if there are inefficiencies in identifying banks with offsetting reserve positions, which can easily arise when there are a large number of active participants in the reserve markets, then there is a strong potential for greater volatility in rates. Such volatility is particularly possible late in the day, when liquidity in funding markets often decreases.

Increased volatility also can result from the greater unpredictability of the aggregate demand for reserve balances when required reserves are low. As noted above, when required reserve balances are low, banks' daily net demands in the funds market are determined more by their day-to-day transactions needs, which in turn depend on a variety of market and payment system factors. Some of these factors, such as settlements for Treasury auctions, other sizable government payments, and coupon and principal payments on private securities, can be identified in advance. Others, however, are idiosyncratic and difficult to anticipate. Consequently, the Federal Reserve's ability to accommodate aggregate fluctuations in day-to-day transactions needs has its limits. Resulting

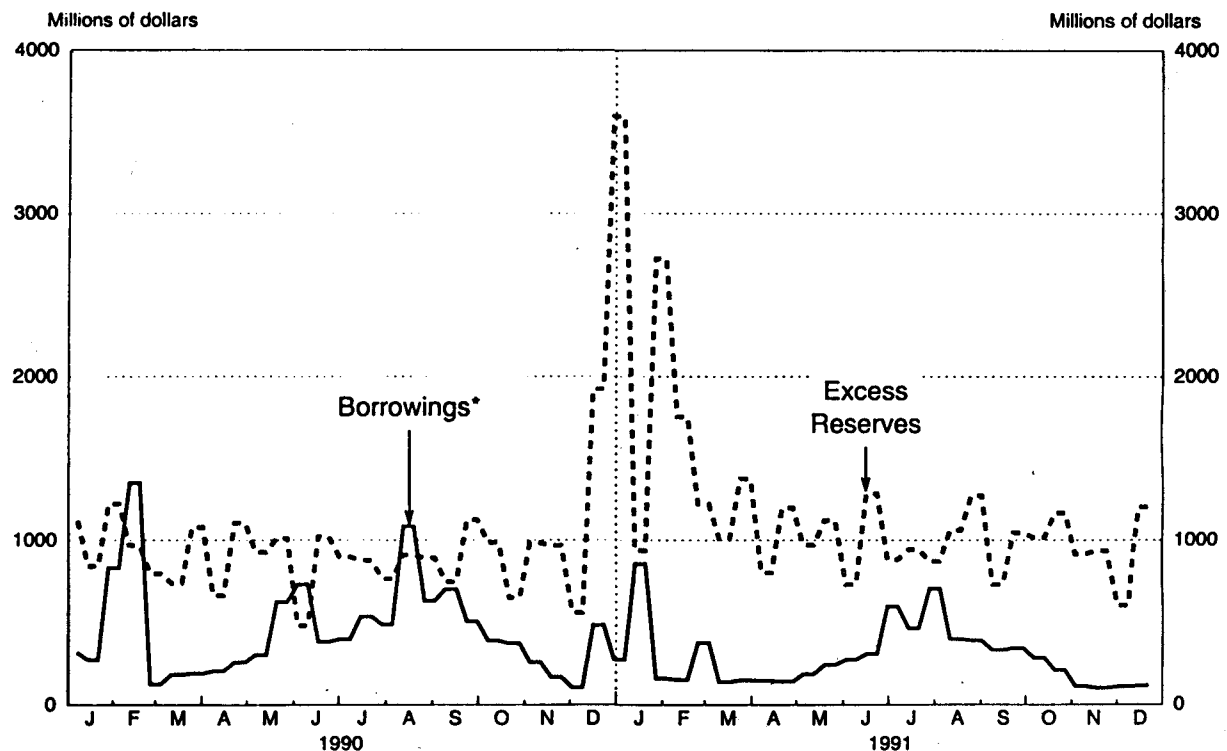
⁸ Respondents to the May 1996 Senior Financial Officer Survey confirmed this hypothesis.

mismatches between reserve demand and supply – particularly in the context of an unwillingness to borrow from the discount window – may add to volatility in the federal funds rate when required reserve balances are low.

7. The 1990-91 episode

Concern about potential market rate volatility stems also from the experience at the end of 1990 and beginning of 1991. At that time, reserve ratio requirements on wholesale funding sources were dropped. Furthermore, there were some concerns about the creditworthiness of some counterparties in the market. Finally, it was the end of the fiscal year for many banks and other companies, creating additional market activity. Figure 9 plots excess and borrowed reserves over this period. The sudden spike in excess reserves at the end of 1990 reflected an immediate but relatively short-lived response to the drop in reserve requirements at that time.

Figure 9
Bank reserve positions
 Average of daily figures for reserve averaging period



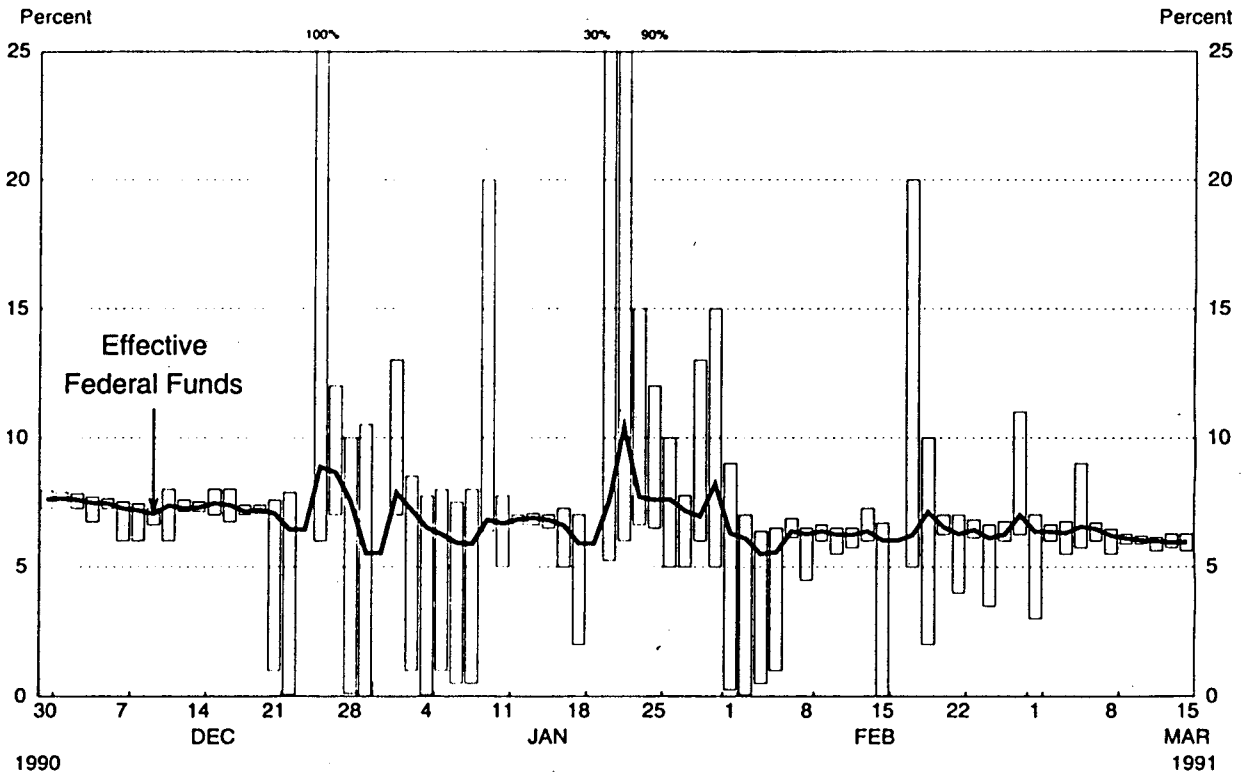
* Excludes extended credit borrowing.

These volatile market conditions were reflected in the transactions prices paid for federal funds. Figure 10 plots the intraday ranges of federal funds rates recorded each day between December 1990 and March 1991. On certain days, transactions prices ranged from near zero to levels as high as one hundred percent. Banks with excess funds in certain cases almost had to give them away, while banks needing funds had to pay very high rates at times.

Fortunately, the situation appeared to have limited economic consequence and was resolved quickly. Figure 11 plots the daily average federal funds rate against three-month libor and US treasury bill rates. Possibly also reflecting the volatility in the overnight federal funds market, the

libor rate was somewhat volatile and high relative to treasury rates. T-bill rates appear to have been unaffected and may even have benefited from some "flight-to-safety" during those days. The average daily federal funds rates did tend to "spike" on Wednesdays at the end of reserve maintenance periods, but overall the volatility was contained.

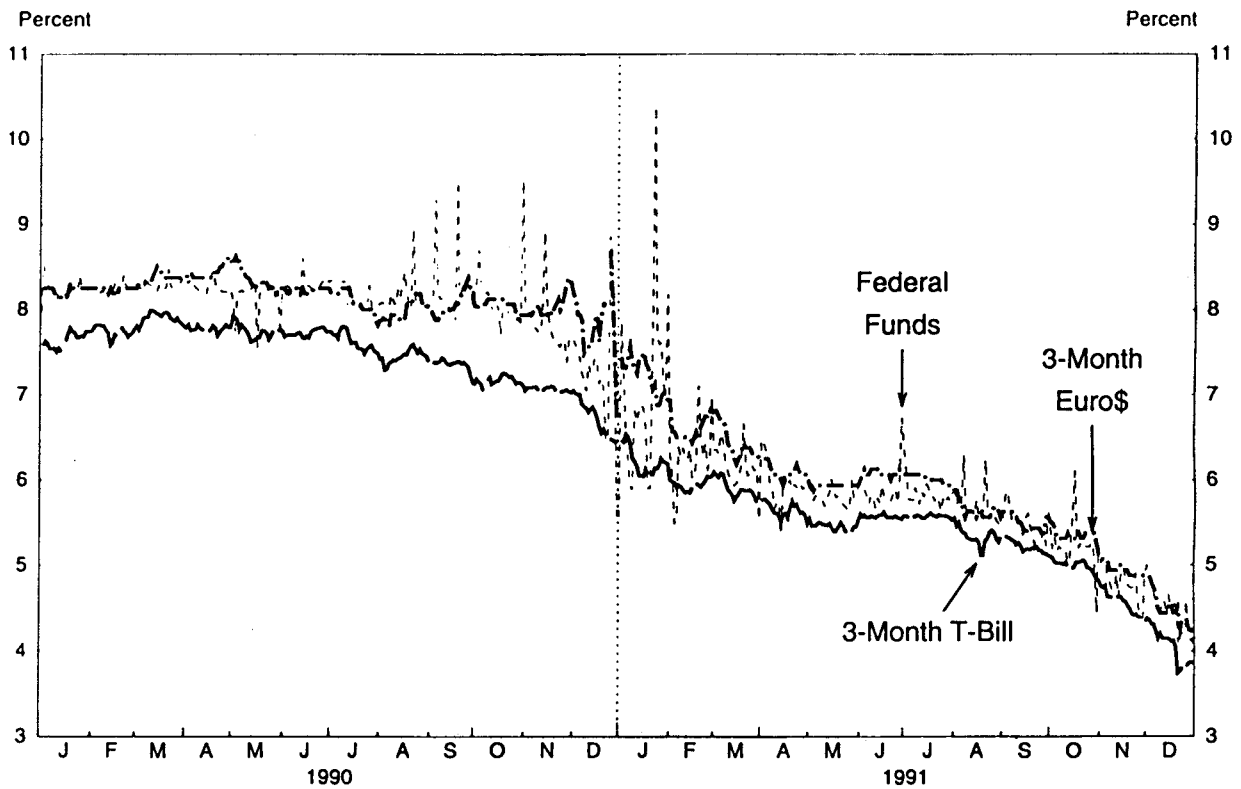
Figure 10
Bank reserve positions: daily high and low federal funds rates
 1990-91 federal funds volatility



Several factors helped alleviate the situation. Because the Federal Reserve was easing monetary policy by reducing short-term interest rates in order to cushion weakness in the economy, growth of money and hence required reserves was relatively rapid, helping to lift required reserve balances above critically low levels. Moreover, more banks opened required clearing balances, and the seasonal trough in required reserves balances passed. In addition, banks may have become more adept at managing their reserve positions with low required balances. As a result of these factors, volatility of the federal funds rate soon returned to normal.

Based on this one episode, it is not possible to sort out the relative contributions of the reserve requirement cut, the end-of-period environment, and other special factors. But it demonstrates the possibility that a low reserve requirement environment may contribute to substantial intraday volatility. Fortunately, the volatility apparently had only moderate effect on other short-term rates and little or none on the effectiveness of monetary policy.

Figure 11
Average federal funds, T-bill and 3-month eurodollar rates



Conclusion

The 1990-91 experience demonstrated the possibility of problems in conducting monetary policy arising in a low-reserves environment. But other factors were at work, and it is difficult to sort out how much was due to transitional and year-end factors. Nevertheless, a reasoned analysis suggests the possibility of unstable overnight interest rates in a low-reserve-requirement environment, particularly if sweep accounts continue to grow rapidly. It remains unclear how important these issues might become from a practical viewpoint of influencing the broader range of market interest rates and liquidity conditions. Whether any procedures have to be reexamined may become more apparent if the trend toward lower reserve requirements continues.