Has Deregulation Ruined M1 As a Policy Guide?

By Howard L. Roth

The apparent breakdown in the relationship between M1 and the economy that began in late 1981 triggered a heated debate. Although most economists agreed that the breakdown had been brought on by the nationwide introduction of NOW accounts, they were divided on the implications of the breakdown for the use of M1 as a policy guide. Some argued that the breakdown would only be temporary, that M1 would again be stably related to the economy once deregulation of deposit rates was complete. Others doubted this prognosis, believing that the deregulated M1 would remain so sensitive to developments other than the course of the economy that it would no longer be useful as a policy guide.

The behavior of M1 since 1981 has supported the pessimists' view. Although the deregulation of M1 has been completed, a reliable relationship between M1 and the economy has not reappeared. Uncertain about M1's relationship to the economy, the Federal Reserve decided not to establish a target range for M1 in 1987. Meanwhile, intense efforts are being made to understand the behavior of M1.

Some of these efforts to understand M1 have focused on the rates paid on M1 deposits. These rates have not behaved as was generally expected. The conventional wisdom a few years ago was that deregulated deposit rates would move in step with short-term market interest rates. As a result, it was thought that M1's appeal would be little affected by changes in market rates because spreads between the rates on the interest-paying deposits in M1 and the rates on other financial assets would remain relatively constant. Thus, it could be argued that deregulation would make M1 a better policy guide. Demand for M1 would vary less with market rates and would reflect to a greater extent developments in the goal variables of monetary policy—income and prices.

Contrary to what was expected, deregulated deposit rates have not moved in step with short-term market rates. Even though deregulation of rates on other checkable deposits (OCD's) was completed in January 1986, rates paid on OCD's

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did not decline as much as the higher rates paid on market instruments in 1986, causing spreads between OCD rates and short-term market rates to narrow.

Unexpectedly rapid growth of M1 during that time did not reflect the true state of the economy and raised the question of whether M1 might have become sensitive to changing portfolio preferences. If M1 did become sensitive to changing portfolio preferences, the sluggish adjustment of deregulated deposit rates was likely instrumental.

The likelihood that M1 might again become a useful policy guide would be increased if rates on deregulated deposits were to begin adjusting more rapidly. This article looks for evidence that deregulated rates are becoming more responsive to market rates. Finding none, it concludes that M1 will continue to be subject to changing portfolio preferences, particularly when market rates are trending in one direction or the other and that, as a result, conditions are not favorable for a quick return of M1 as a policy guide.

The remainder of the article is structured as follows. The first section argues that sluggish deposit rate behavior could impair M1's usefulness as a policy guide. The second section points out that in theory the sluggish behavior of OCD rates could continue. The third section shows that if Super NOW rates are indicative, sluggish adjustment of OCD rates is likely to continue.

Deregulated M1—not what was expected

An essential property of a policy guide is that it be closely related to the economic variables in which the goals of policy are specified. M1 has had this property in the past, but it appears to have lost this property in recent years. The deregulation of deposit rate ceilings and the subsequent behavior of deregulated deposit rates have likely contributed to the deterioration of M1's performance as a policy guide.

How deposit rate deregulation could impair M1 as a policy guide

To be useful as a policy guide, M1 must be closely related to income and the general level of prices in the economy. Without such a close relationship, the Federal Reserve cannot determine the level of growth in M1 that is consistent with sustainable, noninflationary economic growth.

Except for a few well-documented instances, M1 growth before the deregulation of deposit rates mainly reflected economic growth and inflation. This behavior was consistent with a transactions motive for holding M1—the holding of M1 balances in anticipation of spending. Growth of M1 was also influenced by short-term market interest rates, which affect the opportunity cost of holding transactions balances. But except for short-term market rates, growth of M1 depended primarily on economic growth and inflation. As a result, M1 was a good policy guide.

But M1 might not reflect economic growth and inflation so closely with the deregulation of rates on M1 deposits. Inflows of savings balances resulting from deregulation of deposit rates could weaken M1's relationship with the goal variables of policy because savings balances likely have different characteristics than transactions balances. For example, savings balances are likely to reflect decisions on how wealth is allocated among alternative financial and real assets—decisions that would not be heavily influenced by developments in income and prices. Rather, interest rate spreads between financial assets, and possibly between financial and real assets, are important considerations in allocating wealth as are inflation expectations and the relative riskiness of the assets in which wealth can be held. Therefore, if M1 became attractive as a repository for savings balances, it could be influenced more by changes in wealth, by interest rate spreads between OCD's and other financial assets, and by spreads between

OCD rates and returns on real assets—none of which are closely related to income and the general price level. In assessing a change in M1 over a period of time, policymakers are interested in determining how much of the change is due to changes in income and prices. Accurately estimating and subtracting out any changes in M1 due to changing portfolio preferences would make such a determination much more difficult.

Sluggish adjustment of rates on M1 deposits increases the likelihood that changes in portfolio preferences would affect M1 when short-term market rates trend upward or downward. The reason is simple. If other short-term rates change and the rate on OCD's does not keep pace, spreads between OCD rates and the other rates would change. Because M1's appeal as a savings vehicle depends on these spreads, demand for M1 as a savings vehicle would change when short-term rates change.

If instead, rates on OCD's followed market rates closely, M1's appeal as a savings vehicle would vary less with changes in market rates. M1 could still be appealing as a savings vehicle. But changes in market rates would have little effect on rate spreads involving OCD's and thus would have little effect on M1's appeal as a savings vehicle.

Rate spreads that change with market rates are problematic because much less is known about how the demand for M1 as a savings vehicle responds to changes in interest rate spreads than how the demand for M1 as a transactions medium responds. For example, it could be that M1 is appealing as a savings instrument only when the relevant interest rate spreads are less than some critical value. Demand for M1 as a transactions medium, on the other hand, is generally believed to vary continuously with interest rate spreads, at least for individuals. Moreover, the interest sensitivity of the demand for M1 as a transactions medium has been estimated in numerous empirical studies.

The problem is uncertainty about how M1's appeal as a savings vehicle varies with short-term market rates, not uncertainty about the sluggish adjustment of OCD rates. The adjustment of OCD rates could be perfectly understood and perfectly predictable, and uncertainty about how the demand for M1 as a savings vehicle responds to changes in rate spreads would remain if OCD rates responded sluggishly to changes in market rates.

Sluggish adjustment of rates on OCD's could pose problems in two other ways even if the demand for M1 were purely a transactions demand. First, slow adjustment of OCD rates can increase the sensitivity of M1 to changes in short-term market interest rates. Interest sensitivity increases when the OCD rate responds so sluggishly to changes in other short-term rates that spreads involving the OCD rate change proportionally more than the other short-term rates. When this happens, the effect of a change in short-term rates on demand for M1 is magnified, whether the demand for M1 is as a transactions medium, or as a savings vehicle.

An increase in the sensitivity of M1 to changes in short-term market interest rates increases the importance of being able to predict movements in short-term market rates in setting targets for M1. An unexpected change in short-term market rates could cause M1 to depart significantly from its targeted value. Unfortunately, interest rates have proven very difficult to forecast.

The second problem arises when there is uncertainty about the adjustment process. The problem is that the rate on OCD's has to be predicted in setting targets for M1. If the rate on OCD's closely followed other short-term rates, demand for M1 would likely be quite insensitive to changes in short-term rates, including the OCD rate, because the spreads between the OCD rate and other short-term rates would remain relatively unchanged when short-term rates changed. Predicting short-term market rates, including the

OCD rate, would be relatively unimportant in predicting M1. But when the OCD rate responds sluggishly to changes in other short-term rates, as it has since the beginning of deposit rate deregulation, changes in spreads can have an important effect on M1. In this case, accurately predicting short-term market rates, including the OCD rate, is important, and uncertainty regarding the precise nature of the sluggish adjustment of the OCD rate becomes a problem. The results of the empirical study of Super NOW rates in the last section of this article suggest that the adjustment of the OCD rate is a source of uncertainty.

Thus, there are a number of ways in which the deregulation of deposit rates might impair M1's usefulness as a policy guide. Although sluggish adjustment of the OCD rate to changes in other short-term rates can create a number of problems, the remainder of the article focuses on the problems posed by variability in the amount of savings balances held in OCD's that results when rates on OCD's adjust sluggishly. Thus, it is assumed for simplicity that changes in wealth, inflation expectations, and the returns on real assets have no effects on the demand for M1 as savings vehicle. That is, the demand for M1 as a savings vehicle depends only on rate spreads between OCD's and other short-term financial assets that are substitute repositories for savings balances.

The experience in 1985 and 1986

For a number of reasons, it appears that inflows of savings balances contributed to M1's growth in 1985 and 1986. First, growth of M1 was very strong relative to economic growth. While M1 grew 12.2 percent in 1985 and 15.6 percent in 1986, nominal GNP grew only 6.3 percent in 1985 and 4.2 percent in 1986. Chart 1 shows M1 velocity—nominal GNP divided by M1—on a quarterly basis since 1970. From 1970 to 1981, M1 velocity grew at an average annual rate of 3.7 percent, with growth ranging from 1.5 percent in 1979 to 6.1 percent in 1978. In sharp contrast, M1 velocity fell almost 6 percent in 1985 and more than 9.5 percent in 1986. This deviation of M1 velocity from its behavior in the 1970s was the latest manifestation of the apparent breakdown in the relationship between M1 and the economy in late 1981. From 1982 to 1986, the velocity of M1 fell at an annual average rate of 3.4 percent.

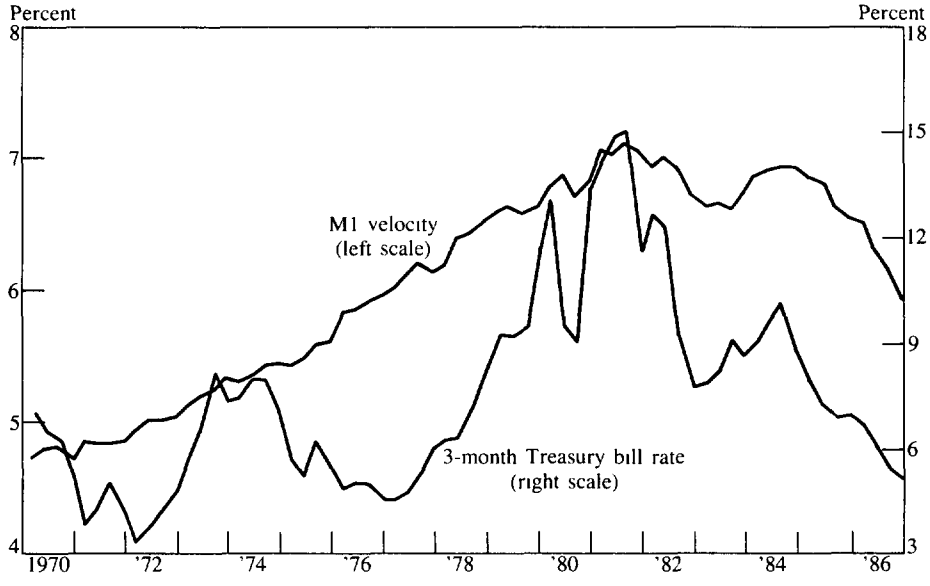
Experience suggests that the declines in short-term market rates during the past two years contributed to the decline of M1's velocity. Three-month Treasury bill rates fell from about 8.2 percent in the first quarter of 1985 to 5.3 percent in the fourth quarter of 1986 (Chart 1). But, previously reliable empirical models of money demand underpredict M1 growth even when simulated with actual levels of short-term interest rates, prices, and income over the two-year period. If declining short-term market rates are the answer, demand for M1 must have become more interest sensitive in recent years.

A second reason for suspecting that inflows of savings balances contributed to M1's growth the past two years is that the growth was strongest in OCD's, the component of M1 that is most attractive as a repository for savings balances. These accounts are liquid; that is, they can be exchanged quickly for other assets with no loss in value. Protected by deposit insurance, OCD's are virtually free of default risk. And of course, OCD's earn interest. As shown in Table 1, OCD's grew 22 percent in 1985 and nearly 29 percent in 1986, more than twice as fast as demand deposits and currency.

A third reason for suspecting that savings flowed into M1 is that rates on some savings alternatives fell relative to the rates on OCD's in 1985 and 1986, and growth of these alternatives slowed as growth of OCD's quickened. For example, as shown in Chart 2, the rate spread between small time deposits and OCD's fell from about 3.2

CHART 1

M1 velocity and the Treasury bill rate



percentage points in the first quarter of 1985 to about 1.0 percentage point in the fourth quarter of 1986. As a result, NOW accounts became more attractive as a repository for savings balances transferred from maturing small time deposits. And, as can be seen in Chart 2, growth of small time deposits slowed sharply while growth of OCD's picked up.

The rate spread between small time deposits and OCD's narrowed over the two-year period because rates on small time deposits matched declines in short-term market rates more closely than OCD rates did. As shown in Chart 3, rates on OCD's have displayed considerable inertia when short-term market rates, as represented by the federal funds rate, have changed.

TABLE 1

Growth of M1 and its components—1985 and 1986

(percent)

	Currency plus Travelers Checks	Demand Deposits	Other checkable Deposits	M1
1985:Q4/1984:Q4	7.8	8.9	22.2	12.1
1986:Q4/1985:Q4	7.5	11.6	28.6	15.2

CHART 2

Growth of small time deposits and OCD's

(percent change from a year earlier)

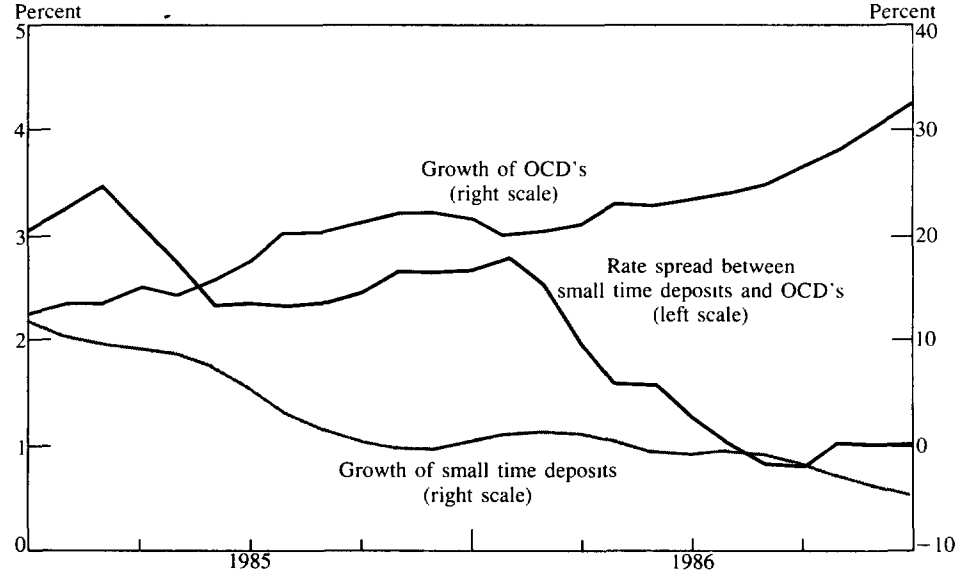
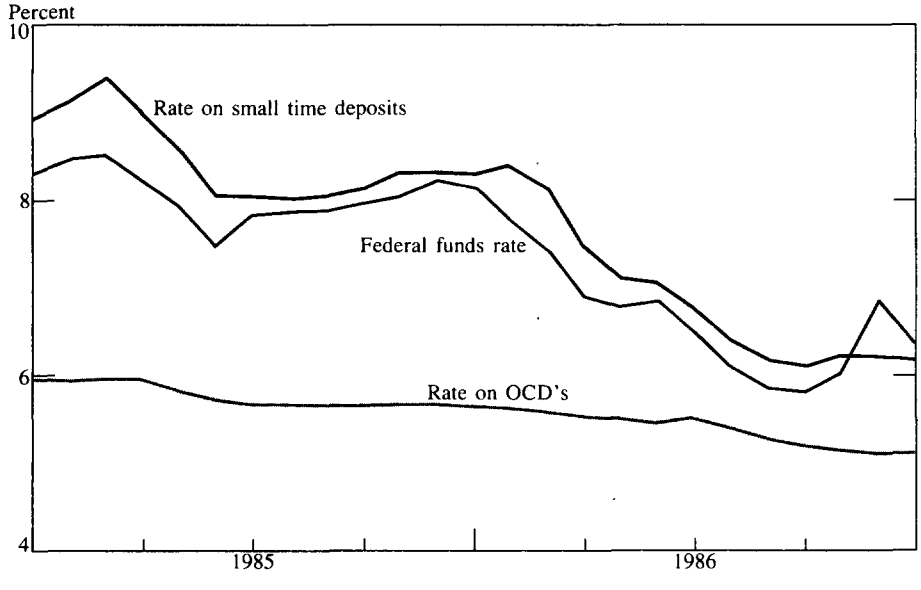


CHART 3

Sluggish adjustment of OCD rates



The sluggish response of OCD rates to changes in short-term market rates came as a surprise. The conventional wisdom in the early 1980s was that rates on deregulated deposits would closely follow short-term market rates. As a result, demand for M1 was expected to become insensitive to changes in short-term market rates. Yet, OCD rates have not followed short-term market rates closely. And this failure to follow other short-term rates closely could explain why recent empirical work and the behavior of M1 in the past two years indicate that demand for M1 has become more sensitive to changes in short-term market rates, not less sensitive.[1]

One important question is, Why have rates on OCD's exhibited so much inertia? Another important question is, Will this behavior be a lasting phenomenon?

Why rates on OCD's adjust sluggishly

Past regulation explains much of the sluggishness in OCD rates since deregulation of M1 began in 1981. Before January 1, 1986, rates on NOW accounts were subject to a ceiling of 5.25 percent. Many banks and thrifts had paid this rate since the nationwide authorization of NOW's in late 1980. Much of the sluggishness in NOW rates in 1986 may thus have been due to reluctance by banks and thrifts to lower rates on NOW's below the old regulatory ceiling. By the second half of the year, short-term market interest rates had declined to levels that made NOW rates higher than 5.25 percent artificially high. But banks and thrifts were concerned that pushing the rate below the old ceiling might antagonize customers accustomed to earning 5.25 percent on their NOW balances. Ironically, what had been a regulatory ceiling rate became a floor when NOW's were deregulated.

But regulation does not totally explain the phenomenon. Super NOW's were not subject to a ceiling since their introduction in January 1983, although they were subject to minimum balance requirements until January 1986. Yet their rates also displayed considerable inertia during this period. And rates on NOW's responded sluggishly to changes in short-term market rates after their ceiling was lifted in January 1986, even before their old ceiling began to have an effect. Thus, something in addition to banks and thrifts' concern about maintaining long-term customer relationships must give rise to the phenomenon.

A number of explanations have been offered. One possibility is that large banks and thrifts might be able to lower total funding costs by slowly adjusting OCD rates. Most large institutions have a relatively smaller presence in the national money markets than in the local OCD market.[2] Such an institution might be able to satisfy additional funding needs by buying funds in the money market at the rates prevailing there but would have to raise the rate it offers on existing OCD's if it tries to raise funds by attracting more OCD's. Under these conditions, changing the rate offered on OCD's to reflect fully changes

[1] See, for example, Richard D. Porter, Paul A. Spindt, and David E. Lindsey, "Econometric Modeling of the Demands for the U S. Aggregates: Conventional and Experimental Approaches," Board of Governors of the Federal Reserve System (mimeo), November 1986, or Michael C. Keeley and Gary C. Zimmerman, "Deposit Rate Deregulation and the Demand for Transactions Media," *Economic Review*, Federal Reserve Bank of San Francisco, Summer 1986, pp. 47-62. For an alternative view, see Robert H. Rasche, "M1-Velocity and Money Demand Functions: Do Stable Relationships Exist?" *Carnegie-Rochester Conference Series*, forthcoming.

[2] Evidence of local and statewide Super NOW markets in the Twelfth Federal Reserve District was found by Michael C. Keeley and Gary C. Zimmerman in "Determining Geographic Markets for Deposit Competition in Banking," *Economic Review*, Federal Reserve Bank of San Francisco, Summer 1985, pp. 25-45.

in short-term market rates might result in higher funding costs. A second possible explanation also involves bank funding behavior. In this explanation, banks and thrifts respond to changes in loan demand by adjusting the rates they offer on managed liabilities and deposits with fixed terms—small time deposits, large CD's, term repurchase agreements—rather than the rates on nonterm deposits like OCD's. When loan demand weakens and banks' funding needs fall, banks lower their rates on deposits with fixed terms. At these times, the spread between term deposits and OCD's narrows, making OCD's relatively more attractive.[3] A third possible explanation is that depository institutions are taking a cautious approach to pricing OCD's as they try to learn how sensitive the public's demand for OCD's is to the rate offered on the accounts.

The first two proposed explanations suggest that the sluggishness of OCD rates will be a continuing phenomenon. But experience with deregulated deposits is too limited to determine which of these explanations best accounts for the sluggishness.

Even though the underlying cause of the sluggish adjustment of OCD rates has not been identified, it should be possible to measure the extent of the sluggishness. A number of researchers have done this.[4] Generally, they have found that Super NOW rates match only about 10 to 15 percent of a change in short-term market rates in one month. The extent of longer run adjustment varies across the studies and depends on the specification used in modeling the relationship between OCD rates and short-term market rates. But in some studies, complete adjustment takes as long as a year.

Although little is known about why rates on deregulated deposits adjust slowly to changes in short-term market rates, the staff of the Federal Reserve Board has shown that taking account of the sluggish adjustment of rates is beneficial in trying to account for the strong growth of M1 in 1985 and 1986.[5] When this behavior is explicitly modeled in the Board's quarterly econometric model, the interest sensitivity of M1 is considerably higher—approximately twice as high when market rates are 5 percent. Increased interest responsiveness of demand for OCD's is attributable for most of the increased interest sensitivity. The interest rate sensitivity of this component averages four times higher in absolute value in the respecified model. The increased interest rate sensitivity allows the respecified model to explain the growth of M1 in 1985 and 1986 more closely than most models that do not explicitly allow for sluggish adjustment of OCD rates.

Although rates on deregulated deposits in M1 were sluggish in adjusting to declining short-term market rates last year, this does not necessarily imply that rates on deregulated deposits did not adjust more rapidly to changes in market rates in 1986 than in, say, 1983. And it does not preclude more rapid adjustment of deregulated rates in coming years. If rates on deregulated deposits are moving toward more rapid adjustment, the likelihood of M1 again becoming a useful policy guide is greater.

[3] This rate spread behavior is an implication of an explanation for the rapid growth of M1 in 1985 and early 1986 proposed by Bharat Trehan and Carl E. Walsh in "Portfolio Substitution and Recent M1 Behavior," *Contemporary Policy Issues*, January 1987, pp. 54-63.

[4] See Paul F. O'Brien, "Deregulated Deposit Rate Behavior," Federal Reserve Board, processed, April 1986; George Moore, Richard Porter, and David Small, "Forecasting Retail Deposit Rates in the Long Run and the Short Run," Board of Governors of the Federal Reserve System (mimeo), July 1986; and John Wenninger, "Responsiveness of Interest Rate Spreads and Deposit Flows to Changes in Market Rates," *Quarterly Review*, Federal Reserve Bank of New York, Autumn 1986, pp. 1-10.

[5] See Richard D. Porter, Paul A. Spindt, and David E. Lindsey, "Econometric Modeling . . ."

Slow adjustment of OCD rates—merely transitional?

The limited experience with deregulated deposits makes it difficult to predict whether the sluggish adjustment of OCD rates will be merely a transitional phenomenon that will abate over time. The account that would be the most likely to shed light on whether OCD rates will become less sluggish is the Super NOW account, which has not been subject to ceiling rates since its introduction.

The experience with Super NOW's

An immediate problem in studying the behavior of deregulated rates is a scarcity of data. OCD's became an appreciable part of M1 only with the nationwide introduction of NOW accounts in 1981. These accounts, eventually referred to as regular NOW's to distinguish them from the Super NOW account introduced later, were subject to a regulatory ceiling until January 1986. The rate most banks and thrifts paid on these accounts varied little from the regulatory ceiling of 5.25 percent over the five-year period. Thus, rates on regular NOW's have little to say about how ceiling-free deposit rates might behave.

The behavior of rates on Super NOW's, however, should be more representative of deregulated deposit rates. Super NOW's have never been subject to a rate ceiling. Experience with these accounts is limited, though, as Super NOW accounts were not introduced until January 1983. A change in the relationship between Super NOW rates and short-term market rates would not show up in quarterly or even monthly data on Super NOW rates unless the change was quite dramatic.

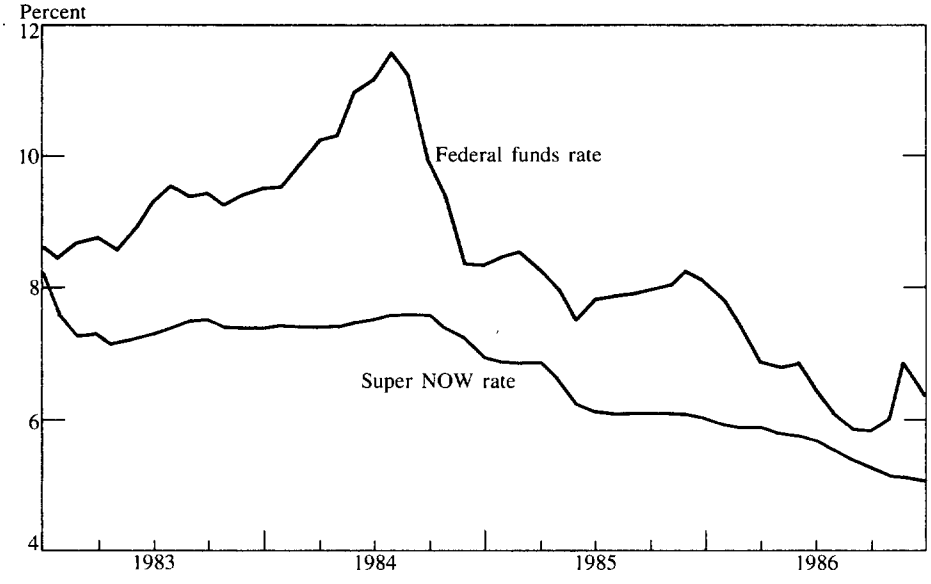
The *Bank Rate Monitor,* however, has been collecting weekly data on Super NOW rates since their introduction. With more than 200 weekly observations, a change in the relationship of these rates to short-term market rates should be more apparent.

When the Super NOW rate is viewed alongside short-term market interest rates, inertia in the Super NOW rate is evident. Chart 4 shows the Super NOW rate and the federal funds rate from 1983 through 1986. Three episodes of sluggish adjustment of the Super NOW rate stand out. Between January and August of 1984, the federal funds rate rose over 200 basis points, while the Super NOW rate rose only about 20 basis points. Between August 1984 and June 1985, the federal funds rate fell about 400 basis points, while the Super NOW rate eased less than 150 basis points. More recently, between December 1985 and October 1986, the federal funds rate fell about 230 basis points, while the Super NOW rate declined only about 80 basis points.

There is little indication in Chart 4 that Super NOW rates have become more responsive to changes in the federal funds rate. A gradual change might not be apparent, however. A test of this hypothesis requires the specification and statistical testing of a general model relating Super NOW rates to the federal funds rate.

A model relating changes in the Super NOW rate to changes in the federal funds rate is described in detail in the appendix. The model allows the Super NOW rate to adjust gradually to changes in the federal funds rate, with one rate of adjustment when the Super NOW rate is adjusting upward and another when it is adjusting downward. There are some indications that banks and thrifts adjust deposit rates more quickly when market rates fall to keep interest rate spreads from becoming too small or even negative, and the model allows for an asymmetrical response. The model also imposes complete long-run adjustment on the Super NOW rate so that the marginal cost to the bank or thrift of an additional dollar of Super NOW's is the same in the long run as the marginal cost of borrowing an additional dollar of federal funds.

CHART 4
Federal funds rate and the yield on Super NOW accounts



To test whether the relationship between the Super NOW rate and the federal funds rate has changed over the last four years, the model was estimated over three periods: July 6, 1983 to December 26, 1984; January 2, 1985 to December 31, 1985; and January 8, 1986 to February 4, 1987. Data from the first half of 1983 were excluded as Super NOW's were being promoted then with rates that were high relative to prevailing market rates. The breakpoint between the first and second periods is somewhat arbitrary, although it coincides with a reduction in the minimum balance requirement on Super NOW's. The breakpoint between the second and third periods marks the elimination of minimum balance requirements on Super NOW's and the lifting of the ceiling rate on regular NOW's.

Statistical tests of the model reveal no significant change in the relationship between the Super NOW rate and the federal funds rate in the first and second periods but a significant change in the third period.[6] The model is so complex, however, that it cannot be determined directly from the regression results whether the Super NOW rate adjusted more or less quickly in the third period. Simulating the estimated models establishes which was the case.

The model as estimated for each of the three periods was simulated for a once-and-for-all change in the federal funds from 6 percent to 5 percent. Estimated with data from the earliest period, the model of Super NOW rates adjusts completely in one year. The adjustment is about the same when the model is estimated with data

[6] The results of the statistical tests are given in the appendix.

from the second period, about 96 percent complete at the end of a year. But in the most recent period, the adjustment is only 64 percent complete at the end of a year. Thus, the adjustment of Super NOW rates was considerably slower in 1986 and early 1987 than in the two earlier periods.

A ceiling becomes a floor

Super NOW rates thus are apparently becoming less responsive to changes in short-term market rates. But this reduced responsiveness may not represent a trend but rather a special situation. As discussed earlier, banks and thrifts were reluctant to lower their NOW rates below the old regulatory ceiling of 5.25 percent in the second half of 1986 for fear of losing long-time customers. Another reason banks and thrifts were reluctant to lower rates on NOW accounts was fear that customers who previously held NOW accounts subject to the ceiling would come to expect the rate on their accounts to move above 5.25 percent when market rates warranted. The reluctance of banks and thrifts to lower rates below the old ceiling may thus account for some of the increased sluggishness in the Super NOW rate in the most recent period.

To test this hypothesis, the model was estimated over the entire sample period from July 6, 1983 to February 4, 1987 with an allowance for the possibility that banks and thrifts were reluctant to lower Super NOW rates below 5.25 percent. The results of the estimation support the hypothesis.[7] Thus, the slowdown in the adjustment of Super NOW rates in the most recent period results to some extent from a special circumstance. Be that as it may, however, the statistical tests show no signs of a transition to more rapid adjustment of Super NOW rates.

Conclusions

The finding that Super NOW rates are not becoming more responsive to changes in short-term market rates casts doubt on a quick return of M1 as a useful policy guide. Sluggish adjustment of rates on OCD's is likely to continue to create problems in using M1 as a policy guide.

This article has focused on one problem stemming from the sluggish adjustment of OCD rates. Because OCD rates adjust sluggishly, changes in short-term market rates affect rate spreads between OCD's and other financial assets and, as a result, increase the likelihood of M1 being affected by portfolio choices. Unfortunately, little is known about how the demand for M1 as a savings vehicle responds to changes in rate spreads. And, of course, changes in M1 resulting from changes in portfolio preferences shed little or no light on economic growth or inflation.

Strictly speaking, M1 has not necessarily become less closely related to income and prices. Rather, the relationship appears to have changed, and the new relationship is not well understood. Under these circumstances, determining the level of M1 growth that is consistent with attaining the goals of policy is difficult, particularly when the trend of short-term market rates changes unpredictably. This point can be restated in terms of velocity. Velocity growth does not have to be constant for M1 to be a useful policy guide. What is necessary is that velocity be predictable.

If rates on deregulated deposits had followed market rates more closely, changes in the relationship between M1 and the goal variables would likely have been more predictable. Spreads between OCD's and other financial assets would have been less affected by changes in short-term market rates. Therefore, M1's appeal as a repository for savings balances would likely have been

[7] See the appendix.

less affected. The relationship between M1 and the economy would have been less affected by changes in portfolio preferences.

Although the empirical results reported in this article suggest that M1 is not likely to return soon as a useful policy guide, two developments could speed M1's recovery. First, to the extent that flows of savings balances into OCD's in the past two years have been a one-time phenomenon, the relationship between M1 and the goal variables of policy could be more stable in the future. More specifically, the relationship will be more stable if the volume of savings balances in OCD's is not sensitive to future changes in rate spreads. If this is the case, changes in M1 will primarily reflect changes in spending intentions.

A second development that might speed M1's recovery as a policy guide would be continued progress toward price stability. Changes in rate spreads and, in turn, changes in portfolio preferences will be less likely if improved price stability can be maintained. Falling inflation expectations appear to have been a significant factor behind declining interest rates and rapid M1 growth in recent years. Changing rate spreads complicate the relationship between M1 and the goal variable of policy primarily when short-term interest rates are trending in one direction or the other. One of the policy victories of the 1980s has been a dramatic reduction in the rate of inflation. Consolidating the gains made against inflation would promote more stable inflation expectations and, in turn, more stable interest rates.

Has deregulation ruined M1 as a policy guide? It is too early to conclude that M1 has been permanently ruined. But M1's usefulness as a guide clearly has been damaged. And there is little reason now to believe that the flows of savings balances into M1 were a one-time phenomenon or that inflation expectations will have less effect on interest rates in the future. A reasonable assumption for now is that M1 will continue to be less closely related to economic growth and inflation, at least for a while.

Appendix

This appendix describes the model of Super NOW rate behavior used in the study, lists the estimated values for the parameter in the model, and documents the results of statistical tests conducted with the model.

Model of Super NOW rate behavior

For statistical reasons, the behavior of Super NOW rates was not modeled in this study as following market rates according to a partial adjustment mechanism. Rather, an error-correction model was used to relate Super NOW rates to a representative short-term market rate, the federal funds rate.[1] The model consists of two equations. The first is a long-run equilibrium relationship between the Super NOW rate and the federal funds rate based on cost minimizing behavior by banks operating in a competitive environment. This relationship, as estimated by researchers at the Federal Reserve Board, is

$$(1)\quad R_t^{SN} = -1.014 + 0.88\, R_t^{FF} + e_t$$

where R_t^{SN} is the Super NOW rate, R_t^{FF} is the federal funds rate, and e_t is the residual in

[1] The approach taken here is the same as that taken by George Moore, Richard Porter, and David Small in "Forecasting Retail Deposit Rates in the Long Run and the Short Run," Federal Reserve Board (mimeo), July 1986. See the references therein on the error-correction model.

period t.[2] This relationship was estimated using data from a monthly survey of deposit rates conducted by the Federal Reserve. The coefficient on the federal funds rate was constrained to equal 1 minus the marginal reserve requirement on Super NOW's, 12 percent, after unconstrained estimation yielded almost identical results.

The second equation specifies short-run dynamic adjustment of Super NOW rates, that is, how Super NOW rates behave when not in equilibrium. This behavior is given by

$$(2)\quad \Delta R_t^{SN} = a \cdot e_{t-1}^{P} + b \cdot e_{t-1}^{N} + \sum_{i=0}^{4} c_i \cdot \Delta R_{t-i}^{FF} + \sum_{i=1}^{4} d_i \cdot \Delta R_{t-i}^{SN} + f \cdot D1 \cdot e_{t-1}^{P} + u_t$$

where $\Delta R_t^{SN} = R_t^{SN} - R_{t-1}^{SN}$; e_t^P is the residual from Equation 1 when that residual is positive—that is, the amount the Super NOW rate exceeds its long-run equilibrium value—and is zero otherwise; e_t^N is the residual from Equation 1 when that residual is negative and is zero otherwise; and D1 is a dummy variable which equals 1 if the long-run equilibrium value of the Super NOW rate is less than 5.25 percent.

When a and b are negative, the first two terms on the right-hand side of Equation 2 force an out-of-equilibrium expected value of the Super NOW rate to return to its long-run equilibrium. Separate terms for positive and negative residuals allow the speed of adjustment of the Super NOW rate to depend on whether it is greater than or less than its long-run equilibrium value. The third and fourth terms allow for a very general reaction of the Super NOW rate to changes in the federal funds rate. The fifth term, incorporating the dummy variable D1, allows the speed of adjustment of the Super NOW rate to slow when the equilibrium rate is below 5.25 percent and the Super NOW rate exceeds the equilibrium rate.

Table A1 lists estimates of the parameters in Equation 2 when estimated over five periods.

Testing the stability of the relationship

To test whether the relationship changed over the three subperiods—January 6, 1983 to December 26, 1984, January 2, 1985 to December 31, 1985, and January 8, 1986 to February 4, 1987—the error correction model was estimated separately over each of these subperiods (columns 1, 2, and 4 of Table A1) and also over combinations of these subperiods (columns 3 and 5). An F-test conducted with the residuals of the regressions listed in columns 1, 2, and 3 of Table A1 indicate no evidence of statistically significant change in the relationship between the first two periods. But an F-test conducted with the residuals of the regressions listed in columns 3, 4, and 5 strongly rejects the hypothesis of no change in the relationship in period 3. The results of the F-tests are given in Table A2.

Effect of old regulatory ceiling

Simulations conducted with the model as estimated in each of the three subperiods demonstrated that Super NOW rates adjusted considerably slower in the most recent subperiod. To test whether this finding was due to the reluctance of banks and thrifts to lower their rates on Super NOW's below the old 5.25 percent regulatory ceiling on NOW's, a dummy variable accounting for this possibility was incorporated into the model and the model was reestimated over the entire sample period. The results of the regression, column 6 of Table A1, show the dummy variable to be a significant explanatory variable (f is significantly different from 0). If the equilibrium Super NOW rate is below 5.25 percent, the response to positive errors is a+f and is smaller in absolute value than a.

[2] See George Moore, Richard Porter, and David Small, "Forecasting Retail Deposit Rates . . . ."

TABLE A1

Short-run dynamic adjustment of the Super NOW rate

Estimated Parameters	Estimation Period: July 6, 1983 to Dec. 26, 1984	Jan. 2, 1985 to Dec. 31, 1985	July 6, 1983 to Dec. 31, 1985	Jan. 8, 1986 to Feb. 4, 1987	July 6, 1983 to Feb. 4, 1987	July 6, 1983 to Feb. 4, 1987
a	−0.033	−0.020	−0.024	−0.037	−0.013	−0.031
	(−2.743)	(−1.353)	(−2.876)	(−4.685)	(−2.829)	(−3.721)
b	−0.001	−0.049	−0.001	0.001	−0.001	−0.003
	(−0.371)	(−0.538)	(−0.302)	(0.056)	(−0.294)	(−0.669)
Σc_i	0.044	0.146	0.066	0.002	0.034	0.026
	(1.839)	(2.054)	(2.938)	(0.073)	(1.911)	(1.880)
Σd_i	0.564	0.547	0.518	−0.888	0.539	0.645
	(3.435)	(3.123)	(4.820)	(−2.629)	(5.471)	(3.856)
f						0.021
						(2.579)
Summary Statistics						
R^2	0.52	0.64	0.57	0.44	0.42	0.45
R^2adj	0.43	0.54	0.53	0.29	0.39	0.41
Standard error (percentage points)	0.021	0.028	0.024	0.026	0.026	0.026

Note: t-statistics in parentheses

TABLE A2

Stability tests

Periods of Comparison	F-statistic	Critical Value	Conclusion
July 6, 1983 to Dec. 26, 1984 and Jan. 2, 1985 to Dec. 31, 1985	1.24	1.88 (5%) 2.43 (1%)	No evidence of change in the relationship
July 6, 1983 to Dec. 31, 1985 and Jan. 8, 1986 to Feb. 4, 1987	6.83	1.85 (5%) 2.37 (1%)	Strong evidence of change in the relationship