Responsiveness of Interest Rate Spreads and Deposit Flows to Changes in Market Rates

Changes in interest rates have long been recognized as an influence on the growth of transactions balances (M1). As market rates rise, depositors have typically reduced their money holdings because the interest income they forgo in holding money balances increases as market rates rise. When the Monetary Control Act of 1980 set a timetable for a gradual deregulation of interest rates on consumer deposits, it was widely recognized that the demand for transactions balances would probably respond differently to changes in market rates than it had in an environment where deposit rates were subject to officially imposed ceilings.[1] But it was not certain whether these balances would become more or less sensitive to changes in market rates because it would depend to a much larger degree on the rate-setting policies of the banks. It now appears, however, that banks have adjusted the rates on deregulated accounts (both on time deposits and transactions accounts) in such a way that the demand for transactions balances has been considerably more interest-sensitive than it was prior to 1980. If these banking practices continue, M1 is likely to speed up or slow down far more than it did in the past in response to decreases or increases in market rates. Deregulation has produced an environment in which changes in market rates have continued to affect the attractiveness of holding M1 balances relative to market instruments. In addition, changes in market rates now can affect the attractiveness of holding M1 balances relative to time deposits by causing spreads between the rates paid on time deposits and M1 balances to narrow or widen.

Since the third quarter of 1984 (when short-term rates peaked) these interest rate spreads have narrowed considerably (see Chart 1). At the same time, M1's growth rate accelerated from 5.4 percent in 1984 to over 11.5 percent in 1985 and the first half of 1986, and its velocity dropped from a 3 percent increase in 1984 to a negative 5.25 percent over the past year and a half. By comparison, during the 1960s and 1970s M1's growth averaged about 5 percent and velocity increased about 3 percent per year.

Because changes in these rate spreads seem to affect M1 and velocity growth so dramatically, a question arises about how these rate spreads adjust to changes in market rates in a deregulated (flexible-rate) environment. In other words, the responsiveness of M1 growth to changes in market interest rates now depends on how rate spreads (between market rates and the rate paid on M1 balances as well as between the rates on time deposits and M1 deposits) adjust to changes in market rates. The large changes in these rate spreads as interest rates fell in 1985 and the first half of 1986 demonstrated that banks do not adjust the rates on various types of deposits in step with market rates, leaving rate spreads (and hence the incentives to shift funds) unaffected as might have been expected in a deregulated structure.[2]

In a regulated environment, the spreads between the market rate and various consumer transaction and time deposit rates tended to move in step with market rate changes because the rates on bank deposits did not change as long as market rates were above the ceiling

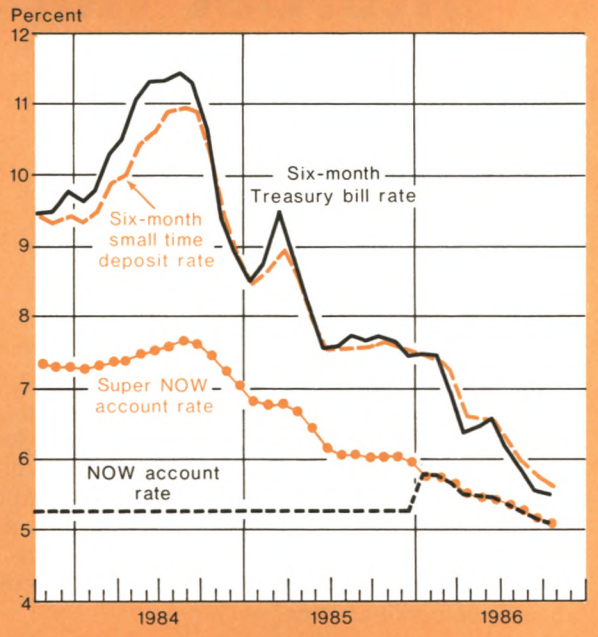
[1]For a detailed listing of the steps in the deregulation of consumer deposits, see R. Alton Gilbert, "Requiem for Regulation Q: What It Did and Why It Passed Away," *Review*, Federal Reserve Bank of St. Louis, February 1986, p. 31.

[2]For more on this aspect of deregulation, see R.G. Davis, "Monetary Targeting in a Zero Balance World," in *Interest Rate Deregulation and Monetary Policy*, Asilomar Conference, Federal Reserve Bank of San Francisco, November 1982.

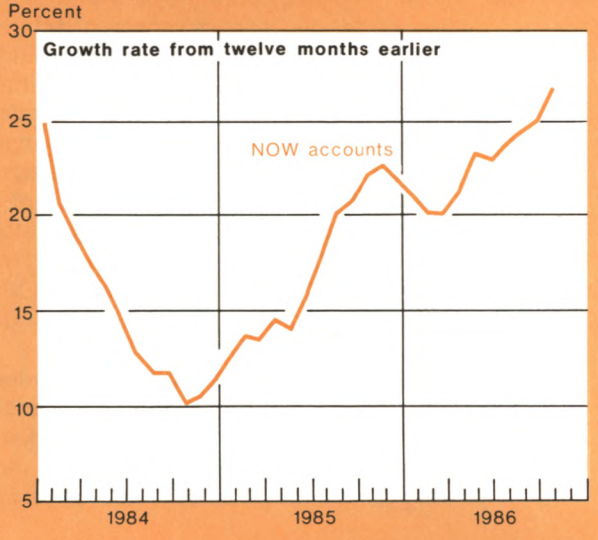
Chart 1

Selected Interest Rate Spreads and Deposit Flows

As market and time deposit rates fell, rate spreads relative to NOW accounts narrowed and M1 growth accelerated . . .



. . . reflecting the more rapid growth in NOW accounts, while small time deposits stopped growing.



Sources: Federal Reserve Board, Statistical Release H.6; Federal Reserve Bulletin.

specified by Regulation Q. Therefore, even though consumers did have incentives to shift funds between market instruments and bank deposits, they had little incentive to shift between time deposits and transactions accounts because these rate spreads tended to remain constant. As long as banks were paying the ceiling rates on deposits, the spreads between the rates on various types of deposits did not change even when market rates increased or decreased.

But now that banks can pay the rate the market dictates on consumer transactions and time deposits, it is important to study the effects that changes in market rates will have not only on (1) the spreads between market rates and the rates paid on bank deposits, but also on (2) the rate spreads between the different types of bank deposits (between time deposits and transactions deposits, for example). This second point is important, of course, because time deposits are part of the M2 definition of money while transactions balances are in M1. The dramatic slowdown in time deposits in 1985 and the first half of 1986, along with the concurrent acceleration in M1 growth as the spreads between the rates offered on time deposits and transactions deposits narrowed, suggest that substitution between M2 components could cause the demand for M1 to be more interest-sensitive in a deregulated environment (Chart 1).[3] Of course, when rate spreads change consumers can move funds not only between time deposits or market instruments and M1 balances, but also into and out of money market deposit accounts (MMDAs) and money market mutual funds (MMMFs). These components of M2 could be alternatives to holding M1 or time deposit balances as interest rate spreads change.

In the first section of this article, the responsiveness of various rate spreads to changes in market rates is reviewed on the basis of some econometric results. By and large, banks, with a lag, have fully adjusted the rate on time deposits to reflect changes in market rates. But they have made only a partial adjustment to their MMDA rates and have been very slow to adjust the rate on deregulated transactions balances (Super NOWs). Hence, even though rates on deposits have been deregulated, consumers still have had an interest rate incentive to reduce their liquidity when market rates rise and increase it when market rates fall.[4]

In the second section of this paper, we review the problems of estimating the responsiveness of deposit flows to changes in rate spreads. As a general note of caution, we have had too little time in a deregulated environment to make very precise estimates. But even with more time, the high correlations among the interest spreads that would affect the deposit flows will make estimates difficult. Nevertheless, we can anticipate the direction of response that some of the components of M2 will make to changes in market rates, based on the way interest rate spreads have responded to changes in market rates.

Responsiveness of interest rate spreads

Ten interest rate spreads are studied in this article:

(1) Six-month Treasury bill less six-month time deposit.
(2) Six-month Treasury bill less Super NOW.
(3) Six-month Treasury bill less MMDA.
(4) MMDA less Super NOW.
(5) Six-month time deposit less Super NOW.
(6) Six-month time deposit less MMDA.
(7) Six-month Treasury bill less MMMFs.
(8) Six-month time deposit less MMMFs.
(9) MMMFs less MMDAs.
(10) MMMFs less Super NOWs.[5]

The table in the box shows the results when the weekly changes in these ten rate spreads are regressed on current and lagged changes in the six-month Treasury bill rate. Based on these results, Charts 2 through 6 illustrate the response over time of the rate spreads to changes in market rates.

Chart 2 (bottom line) shows the response over time of the spread between the six-month bill rate and the six-month time deposit to changes in the six-month bill rate. In other words, we want to see what happens to the spread between the market rate and the time deposit rate when the market rate changes. The chart shows that initially the spread widens considerably, but after about ten to twelve weeks banks have adjusted the rate on time deposits to reflect completely the change in market rates.

At the other extreme, banks are very slow to adjust the Super NOW rate when market rates change.[6]

[3]For more detail, see J. Wenninger and L. Radecki, "The Monetary Aggregates in 1985," this *Review*, Winter 1985-86.

[4]Of course, now that the rates on consumer deposits are competitive with market instruments, the demand for bank deposits might be affected to a larger degree than in the past by changes in inflationary expectations or changes in the expected returns on other investments such as stocks.

[5]In theory, the spreads between the rates earned on longer term time deposits and these deposits could be important as well. To keep the number of rate spreads manageable, however, longer term rates on time deposits were not included. For an analysis of longer term deposit rates as well as short-term rates, see Paul O'Brien, "Deregulated Deposit Rate Behavior," Board of Governors of the Federal Reserve System, April 1986, unpublished.

[6]As of March 31, 1986, the distinction between conventional NOW accounts and Super NOWs was no longer meaningful. By that time, the minimum balance requirements for Super NOWs had been eliminated and the interest rate ceilings on savings deposits

The top line in Chart 2 shows that even after twelve weeks the Super NOW rate has changed by only about 25 percent of the change in market rates, and therefore changes in market rates have had long-lasting effects on the spread between market rates and the Super NOW rate. (This can also be seen from Chart 1.)

Between these two extremes is the responsiveness of the MMDA rate. The center line in Chart 2 shows that after a twelve-week period, the spread between market and MMDA rates has adjusted about 60 percent of the way to the change in market rates, as compared with 25 percent for Super NOWs and 100 percent for time deposits. Thus, along the liquidity spectrum from transactions accounts to time deposits, there have been increasingly fuller adjustments to changes in market interest rates.

Apparently, banks have not made rapid adjustments to the Super NOW rate, either due to lack of experience in pricing these accounts, or reluctance to make frequent changes to the terms offered on transactions accounts once they set a combination of fees, minimum balances, and an interest rate on Super NOWs. In other words, banks may have wanted to market Super NOWs not as flexible rate accounts, but as fixed-rate accounts on which the terms do not change frequently but consumers still earn a fair rate of return on average over the longer run.

On the other hand, banks have had considerably more experience with offering flexible rates on time deposits. Indeed, for several years the ceiling rates on six-month time deposits were linked directly to changes in the Treasury bill rate. Hence, banks were quicker to adjust time deposit rates to follow market rates after the ceilings rates on time deposits were eliminated. In addition, with time deposits banks are adjusting only the rate offered on maturing or new deposits; the rate on the nonmaturing stock remains unchanged. Hence, their cost of funds from this source adjusts gradually to changes in market rates even if they quickly match any change in market rates with a change in time deposit rates. In contrast, with Super NOWs any change in the rate offered by banks affects the entire stock of deposits since Super NOWs for all practical purposes do not have a maturity like time deposits do. Therefore, banks may feel that they have better control over the cost of funds from this source if they promote them as fixed-rate accounts or accounts on which the terms change only infrequently. In any case, it appears that M1 has retained a significant, if not a larger interest elasticity over the last few years as a result of the way banks have adjusted the rates on Super NOWs and time deposits.[7]

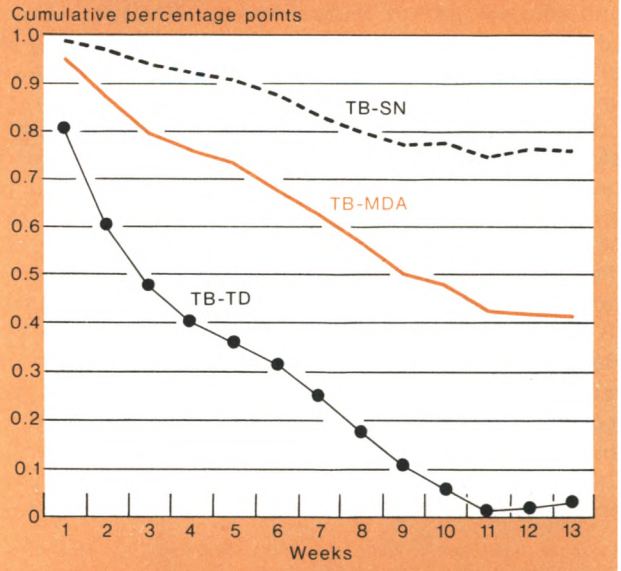
MMDAs, as a combination savings/checking instrument, probably involve a combination of the above considerations for banks. MMDAs were introduced as a means for banks to compete effectively with MMMFs. Hence, they were viewed from the start as a flexible-rate deposit, and banks may have been predisposed to

Footnote 6 continued
(including conventional NOWs) were no longer effective. For most of the three-year period studied in this article, however, the distinction between Super NOWs and conventional NOWs was important because banks could vary the rate on the former, while there was a ceiling rate on the latter. How banks varied the interest rate on Super NOWs during this period in response to changes in market rates is of interest because it gives some insights into how they are likely to administer all NOW accounts now that they are deregulated.

[7]This result may not hold in the very long run, of course. If market rates changed and then held steady for a very long period, banks would probably over time adjust the Super NOW rate to reflect this change fully, after allowing for the cost of required reserves. Over shorter periods of time in a less stable interest rate environment, however, it appears that significant changes in rate spreads can occur that strongly affect M1's growth. The overall responsiveness of deposit flows to changes in market rates depends, of course, not only on how rate spreads change but also on how responsive consumers are to a given change in these spreads. In this article, we are focusing primarily on how much rate spreads adjust to changes in market rates.

Chart 2

Responses of the Spreads Between the Treasury Bill Rate and the Time Deposit, MMDA, and Super NOW Rates to Changes in the Treasury Bill Rate*



*Cumulative responses of the spreads between the six-month bill rate (TB) and the six-month time deposit rate (TD), MMDA rate (MDA), and Super NOW rate (SN) to a change in the bill rate (percentage points).

Estimating the Response of Rate Spreads To Changes in Market Rates

To illustrate how various interest rate spreads have responded to changes in market rates, the change in each spread was regressed on the current and lagged changes in the six-month Treasury bill rate (see table). The sum of the coefficients, which represents the total response over thirteen weeks, is shown at the bottom of each column. For example, the total response of the spread between the six-month bill rate and the six-month time deposit rate to a change in the bill rate is zero. That is, when the bill rate increases by a given amount, so does the time deposit rate, leaving the spread after thirteen weeks unaffected (column 1). In contrast, the total response of the spread between the six-month bill rate and the Super NOW rate to a change in the bill rate is 0.77 (column 2). Thus, if the Treasury bill rate increases one percentage point, after thirteen weeks the spread between the Treasury bill rate and the Super NOW rate will be about three-quarters of a percentage point wider than it was before the change in the bill rate. In other words, the Super NOW rate only adjusts by about 25 percent (1-0.77) of the change in the market rate, leaving the spread about 0.75 percentage points wider. The remaining eight columns in the table show what happens to other rate spreads when the bill rate changes.*

*In the table, there are four basic equations (shown in columns 1, 2, 3 and 7) which determine how the rates on time deposits, Super NOWs, MMDAs and MMMFs adjust to changes in the market rate. The response of the six remaining spreads to changes in market rates can either be estimated, as was done here, or calculated from the results obtained from the four basic equations.

Response of Various Rate Spreads to Changes in Treasury Bill Rate*

	(1) Six-Month Bill Less Six-Month Time Dep.		(2) Six-Month Bill Less Super NOW		(3) Six-Month Bill Less MMDA		(4) MMDA Less Super NOW		(5) Six-Month Time Dep. Less Super NOW	
t	0.81	(41.0)	0.99	(58.0)	0.95	(45.8)	0.03	(2.4)	0.18	(9.4)
t-1	−0.20	(10.4)	−0.01	(0.9)	−0.08	(3.8)	0.06	(5.0)	0.19	(9.9)
t-2	−0.13	(6.3)	−0.03	(1.8)	−0.07	(3.5)	0.04	(3.2)	0.09	(4.8)
t-3	−0.07	(3.7)	−0.02	(1.1)	−0.04	(1.9)	0.02	(1.6)	0.06	(2.8)
t-4	−0.04	(2.1)	−0.01	(0.8)	−0.03	(1.3)	0.01	(0.9)	0.03	(0.9)
t-5	−0.05	(2.3)	−0.03	(1.6)	−0.05	(2.6)	0.03	(2.1)	0.02	(0.9)
t-6	−0.07	(3.3)	−0.05	(2.8)	−0.05	(2.4)	0.003	(0.2)	0.02	(0.9)
t-7	−0.08	(3.8)	−0.03	(1.8)	−0.06	(2.9)	0.03	(2.3)	0.04	(2.3)
t-8	−0.07	(3.5)	−0.03	(1.6)	−0.06	(3.1)	0.04	(2.8)	0.04	(2.1)
t-9	−0.05	(2.4)	−0.002	(0.1)	−0.02	(1.2)	0.03	(2.0)	0.05	(2.6)
t-10	−0.05	(2.4)	−0.03	(1.6)	−0.05	(2.6)	0.03	(2.1)	0.02	(1.0)
t-11	0.01	(0.6)	0.02	(1.0)	−0.006	(0.1)	0.02	(1.7)	0.005	(0.3)
t-12	0.01	(0.5)	0.001	(0.06)	−0.002	(0.3)	0.001	(0.1)	−0.01	(0.6)
Total	0.02		0.769		0.432		0.344		0.735	
R^2	0.94		0.96		0.94		0.43		0.70	
D.W.	1.48		1.80		1.67		1.83		1.30	

	(6) Six-Month Time Dep. Less MMDA		(7) Six-Month Bill Less MMMFs		(8) Six-Month Time Dep. Less MMMFs		(9) MMMFs Less MMDA		(10) MMMFs Less Super NOWs	
t	0.15	(7.7)	1.04	(36.0)	0.23	(7.2)	−0.08	(2.4)	−0.05	(1.6)
t-1	0.13	(6.5)	−0.26	(9.1)	−0.06	(1.8)	0.18	(5.3)	0.25	(7.3)
t-2	0.05	(2.6)	−0.13	(4.4)	−0.002	(0.07)	0.05	(1.5)	0.10	(2.8)
t-3	0.03	(1.7)	−0.13	(4.3)	−0.05	(1.6)	0.09	(2.5)	0.11	(3.1)
t-4	0.01	(0.7)	−0.12	(4.1)	−0.08	(2.4)	0.09	(2.7)	0.11	(3.1)
t-5	−0.01	(0.5)	−0.08	(2.7)	−0.03	(1.0)	0.02	(0.7)	0.05	(1.5)
t-6	0.001	(0.8)	−0.05	(1.8)	0.01	(0.4)	0.00	(0.0)	0.004	(0.1)
t-7	0.01	(0.8)	−0.04	(1.3)	0.04	(1.1)	−0.02	(0.7)	0.007	(0.2)
t-8	0.004	(0.2)	−0.07	(2.3)	0.0001	(0.004)	0.004	(0.1)	0.04	(1.2)
t-9	0.02	(1.2)	−0.03	(1.0)	0.02	(0.6)	0.004	(0.1)	0.03	(0.9)
t-10	−0.008	(0.4)	−0.06	(2.0)	−0.01	(0.4)	0.004	(0.1)	0.03	(0.9)
t-11	−0.02	(0.9)	−0.02	(0.7)	−0.03	(0.9)	0.01	(0.4)	0.04	(1.1)
t-12	−0.01	(0.6)	−0.02	(0.7)	−0.03	(0.9)	0.02	(0.5)	0.02	(0.5)
Total	0.366		0.03		0.008		0.452		0.741	
R^2	0.50		0.92		0.27		0.33		0.49	
D.W.	1.32		2.42		2.28		2.12		2.12	

*T-statistics in parenthesis.
Source: *Bank Rate Monitor*. Estimation period: weekly 10/12/83 to 7/23/86.

adjusting the rate on MMDAs when market rates changed more than the rates on Super NOWs. However, like Super NOWs, the rate on the entire stock of MMDAs changes when banks adjust the rate offered on MMDAs. Again banks might be slower to adjust the rates on MMDAs than on time deposits in an effort to avoid large fluctuations in the costs of funds from this source. On balance, it is not surprising that the rate on MMDAs has shown a response to changes in market rates that is between the responses of the time deposit and the Super NOW rates.

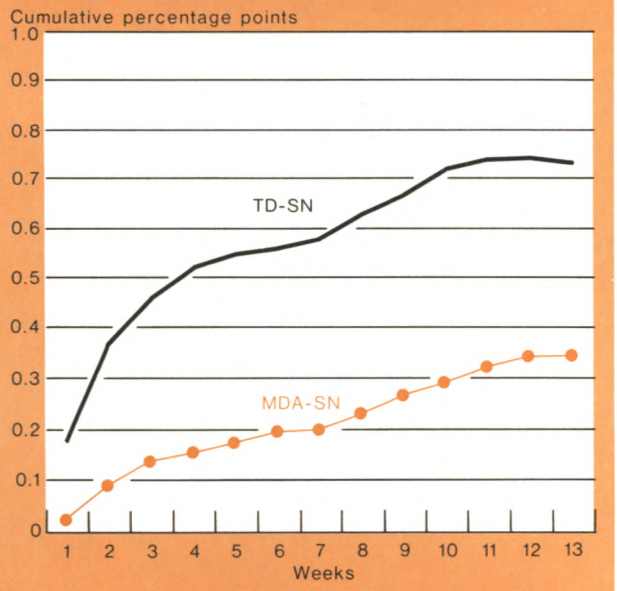
When market rates change, the rate spreads change not only between market rates and various bank liabilities but also between the types of bank liabilities. And changes in these spreads might induce shifts between components of M2, perhaps affecting the growth of M1 as a result.

Chart 3 (bottom line) illustrates the effect on the rate spread between MMDAs and Super NOWs when the market rate changes. Initially, banks are slow to adjust both of these rates to changes in market rates, but after a twelve-week period, the spread changes by about 33 percent of the change in market rates, creating an incentive for consumers to shift funds between MMDAs and Super NOWs. These shifts could have some effect on the growth of M1 but would leave M2 growth unchanged. We would expect the effect on M1 growth to be small because the rate spread does not appear responsive enough to changes in market rates to cause large substitutions between MMDAs and Super NOWs.

The top line in Chart 3 shows much more dramatic effects on the rate spread between time deposits and Super NOWs when the market rate changes. As in the previous case, there is little effect in the first week. But after twelve weeks, the rate spread between time deposits and Super NOWs has moved by 75 percent of the amount that the market rate changed. This reflects the tendency for the time deposit rate (with a lag of twelve weeks) to follow the market rate much more fully than the Super NOW rate does. As a result, substitutions between time deposits and Super NOWs are likely to have sizeable effects on M1 growth when market

Chart 3

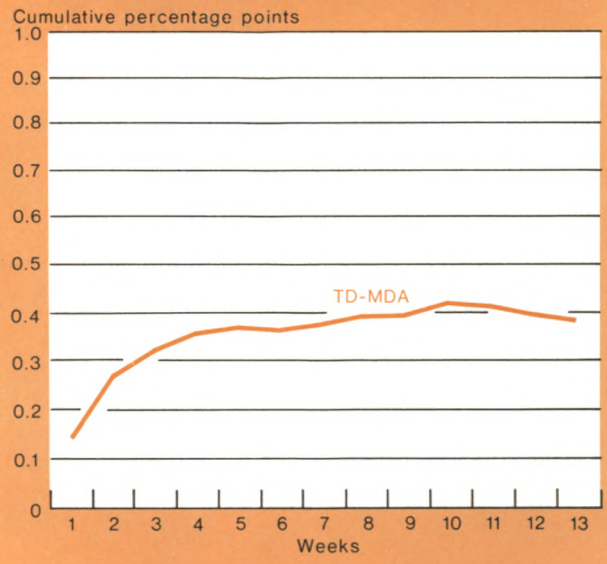
Responses of the Spreads Between the MMDA and Super NOW Rates and Between the Time Deposit and Super NOW Rates to Changes in the Treasury Bill Rate*



*Cumulative responses of the spreads between money market deposit rate (MDA) and the Super NOW rate (SN) and between the time deposit rate (TD) and Super NOW rate to a change in the bill rate (percentage points).

Chart 4

Response of the Spread Between the Time Deposit Rate and the MMDA Rate to Changes in the Treasury Bill Rate*



*Cumulative responses of the spread between the six-month time deposit rate (TD) and the money market deposit rate (MDA) to a change in the bill rate (percentage points).

rates change. As noted earlier, this would in a sense be a new source of M1 growth when market rates change and could well be contributing to M1's increased responsiveness to interest rate changes in recent years.

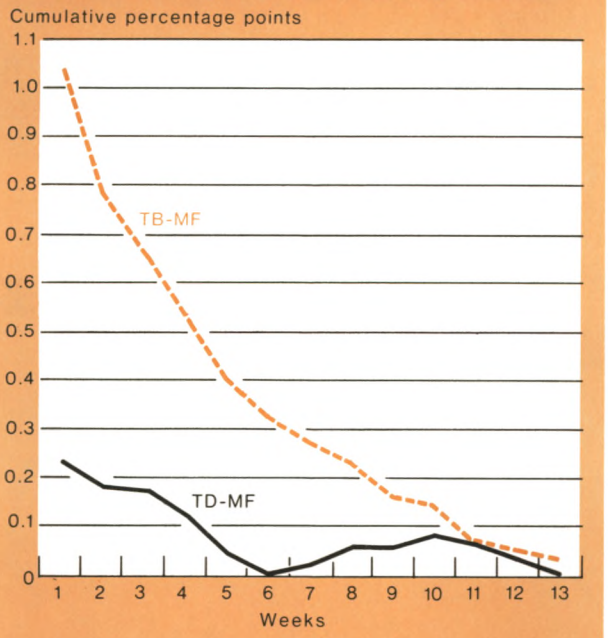
Moreover, changes in market rates might also prompt some shifting of funds from time deposits into more liquid MMDAs. This would not affect M1 or M2 but would affect the overall liquidity of the consumer sector. Chart 4 shows that the spread between the time deposit rate and the MMDA rate after twelve weeks changes by about 40 percent of the amount that the market rate has changed. Therefore, while consumers might also respond to lower rates on time deposits by increasing their holdings of MMDAs, their response is not likely to be very large because the impact on the rate spread when market rates change is quite small (about 50 percent of the size of the impact on the rate spread between time deposits and Super NOWs in Chart 3).

Finally, changes in market rates affect the rates earned not only on various types of bank deposits, but also on a very close substitute for bank deposits, MMMFs. Chart 5 shows that a change in market rates does not result in a permanent change in the rate spreads between market instruments and the MMMFs or between time deposits and the MMMFs.[8] However, more sizeable changes in rate spreads between MMMFs and MMDAs or Super NOWs have occurred when market rates change (Chart 6). Hence, changes in market rates could result in some funds flowing into or out of MMMFs and out of or into NOW accounts or MMDAs. Moreover, since fairly large spreads between the rates on MMMFs and MMDAs have occurred, it does not appear that the rates being offered by MMMFs are the primary factor determining how banks set the rate on MMDAs.

[8]This result should be expected from the basic way MMMFs operate. That is, as their market instruments mature and are gradually reinvested at the prevailing interest rate, the average rate of return on their overall portfolio gradually moves toward the market rate.

Chart 5

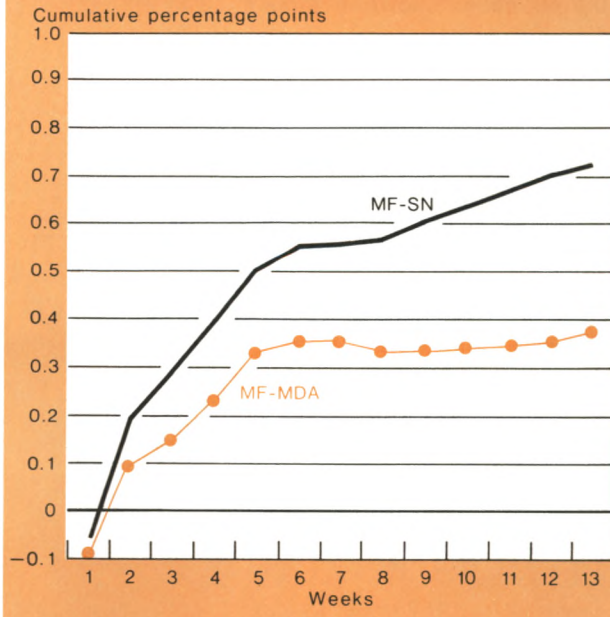
Responses of the Spreads Between the Treasury Bill Rate and MMMFs Rate and Between the Time Deposit Rate and MMMFs Rate to Changes in the Treasury Bill Rate*



*Cumulative responses of the spreads between the six-month bill rate (TB) and money market mutual funds rate (MF) and between the time deposit rate (TD) and MF to a change in the bill rate (percentage points)

Chart 6

Responses of the Spreads Between the MMMFs and MMDA Rates and Between the MMMFs and Super NOW Rates to Changes in the Treasury Bill Rate*



*Cumulative responses of the spreads between the money market mutual funds rate (MF) and the money market deposit rate (MDA) and between MF and the Super NOW rate (SN) to a change in the bill rate (percentage points).

Responsiveness of deposit flows

In terms of very broad trends, Chart 1 shows how deposit flows have responded to changes in interest rate spreads. However, this section will give some reasons why precise estimates of how strongly deposit flows will respond to changes in these spreads are not possible now. Since MMDAs and Super NOWs were introduced in 1983, we have data for only about three years in which all four flexible-rate instruments were available—too short a period to estimate money demand equations with monthly or quarterly statistics, particularly since the equation for each type of deposit (MMDAs, Super NOWs, MMMFs, and time deposits) would in theory include four interest spreads and seasonal dummies, as well as some other variables as explanatory variables. (Table 1 shows which of the ten rate spreads would appear in each of the demand equations as well as the expected signs on the coefficients.)

Even when more statistics become available, serious problems will arise in estimating the responsiveness of deposit flows to changes in the various rate spreads. These rate spreads, since they all respond to changes in market rates in a deregulated environment, tend to be correlated with one another, creating the problem of multicollinearity among the rate spreads used as explanatory variables. Table 2 shows the degree of correlation among the rate spreads that would be used in the equations shown in Table 1.

Table 1

Rate Spreads for Demand Equations*

Rate Spreads	Types of Deposits: SNOWs	MMDAs	MMMFs	Time Deposits
TD-TB				X(+)
TD-MDA		X(−)		X(+)
TD-MF			X(−)	X(+)
TD-SN	X(−)			X(+)
MDA-TB		X(+)		
MDA-MF		X(+)	X(−)	
MDA-SN	X(−)	X(+)		
MF-TB			X(+)	
MF-SN	X(−)		X(+)	
SN-TB	X(+)			

*The x's indicate which rate spreads should be included in the demand equation for each type of deposit. The + or − signs in parentheses indicate whether a widening in the spread would cause more rapid (+) or slower (−) growth in a given type of deposit.

Where:
TD = rate on six-month time deposit
TB = rate on six-month Treasury bill
MDA = rate on MMDA
MF = rate on MMMFs
SN = rate on Super NOWs

The most striking result from Table 2 is the high degree of correlation among the spreads that would be included in the demand equation for Super NOWs. Since the rates on the other three types of deposits adjust more fully and quickly to changes in market rates than the Super NOW rate, a high degree of correlation exists among the rate spreads that would logically be included in a demand equation for Super NOWs. Indeed, the correlation (multicollinearity) is so high and so extensive that it appears very unlikely that reliable estimates of the responsiveness of Super NOWs to changes in these spreads could be obtained.

Table 2

Correlation Between Rate Spreads*

Monthly Levels and (Changes)

	Time Deposits: TD-TB	TD-MDA	TD-MF	TD-SN
TD-TB	1.00 (1.00)			
TD-MDA	0.00 (0.02)	1.00 (1.00)		
TD-MF	0.25 (0.07)	0.02 (0.06)	1.00 (1.00)	
TD-SN	0.00 (0.00)	0.74 (0.85)	0.06 (0.01)	1.00 (1.00)

	Money Market Deposit Accounts: MDA-TB	MDA-TD	MDA-MF	MDA-SN
MDA-TB	1.00 (1.00)			
MDA-TD	0.53 (0.43)	1.00 (1.00)		
MDA-MF	0.30 (0.16)	0.87 (0.62)	1.00 (1.00)	
MDA-SN	0.19 (0.01)	0.45 (0.29)	0.48 (0.36)	1.00 (1.00)

	Money Market Mutual Funds: MF-TB	MF-TD	MF-SN	MF-MDA
MF-TB	1.00 (1.00)			
MF-TD	0.54 (0.39)	1.00 (1.00)		
MF-SN	0.06 (0.07)	0.15 (0.11)	1.00 (1.00)	
MF-MDA	0.10 (0.05)	0.24 (0.17)	0.78 (0.88)	1.00 (1.00)

	Super NOWs: SN-TB	SN-TD	SN-MF	SN-MDA
SN-TB	1.00 (1.00)			
SN-TD	0.87 (0.54)	1.00 (1.00)		
SN-MF	0.80 (0.34)	0.98 (0.82)	1.00 (1.00)	
SN-MDA	0.78 (0.20)	0.91 (0.68)	0.90 (0.71)	1.00 (1.00)

*The R^2s that result when the interest rate speads that would appear in each of the demand equations are regressed on one another. Since four rate spreads would appear in each demand equation, there are six combinations of possible interest-rate-spread regressions for each type of deposit. The estimation period is from October 1983 to June 1986.

TD = six-month time deposit rate
TB = six-month Treasury bill rate
MDA = MMDA rate
MF = MMMF rate
SN = Super NOW rate

Source: *Bank Rate Monitor.*

The multicollinearity problem is somewhat less severe for the other three categories of deposits, but probably still serious enough to raise questions about whether reliable demand equations could be estimated. In particular, Table 2 shows that for the time deposit demand equation there would be strong correlation between the (TD-SN) and the (TD-MDA) spreads. For the MMDA demand equation, there would be a strong correlation between the (MDA-MF) and the (MDA-TD) spreads, and somewhat weaker correlations between the (MDA-TD) and the (MDA-TB) spreads, the (MDA-SN) and the (MDA-TD) spreads, and the (MDA-SN) and the (MDA-MF) spreads. And for the MMMFs demand equation, there would be a strong correlation between the (MF-MDA) and the (MF-SN) spreads and a somewhat weaker correlation between the (MF-TD) and the (MF-TB) spreads.[9]

This multicollinearity among the interest-rate-spread variables in all the equations is at least in part a by-product of a deregulated financial structure. When ceiling rates were fixed in a regulated structure, the spreads between the interest rates on deposits tended not to change when market rates changed. Now all these spreads can change as market rates change, and particularly in the case of Super NOWs, the outcome is an environment where it will be extremely difficult to estimate demand equations using rate spreads. Nevertheless, general trends (as shown in Chart 1) strongly suggest that these rate spreads are significantly affecting M1.

Though we cannot estimate precisely how much deposit flows will respond to changes in interest rate spreads, we can infer from the responses of interest spreads to changes in market rates the direction that deposit flows are likely to move:

(1) Time deposits should grow more rapidly as market rates increase. Since the rate on time deposits adjusts fully to the change in market rates, there should be no net loss of funds into market instruments. Likewise, there should be no net inflow or outflow of funds from MMMFs into time deposits because the rate on MMMFs over a twelve-week period also fully adjusts to changes in market rates. However, time deposits should grow more rapidly as market rates rise because of shifts of funds from MMDAs and Super NOWs into time deposits. The rates earned on MMDAs and Super NOWs do not fully adjust to changes in market rates, causing their spreads with time deposits to change as a result.

(2) Super NOWs should grow more slowly as market rates increase. Funds should flow from Super NOWs not only into market instruments but also into time deposits, MMMFs, and MMDAs because the rates on these three other deposits adjust more fully and rapidly to changes in market rates than the Super NOW rate.

(3) MMDAs will probably grow more slowly as market rates increase. MMDAs would lose funds to market instruments, time deposits, and MMMFs when market rates rise, but perhaps gain some funds from Super NOWs.

(4) MMMFs should grow more rapidly as market rates increase. In the longer run, MMMFs should not lose any funds to market instruments or time deposits (the rate on MMMFs fully adjusts to changes in market rates) and should gain some funds from MMDAs and Super NOWs, since the rates on these types of deposits do not fully adjust to changes in market rates.

Overall, as market rates increase, time deposits and MMMFs should grow more rapidly and NOW accounts and MMDAs should grow more slowly. Chart 7 shows that these patterns have generally held over the last three years. Time deposits showed their most rapid growth relative to trend at about the time interest rates peaked in 1984 and have slowed since then. In contrast, NOW accounts and MMDAs showed their weakest growth at about the time interest rates peaked and have accelerated as interest rates have fallen. By and large, MMMFs have displayed a pattern similar to time deposits, but the chart suggests that the main flows as market rates change are between time deposits and NOW accounts or MMDAs.

Conclusions

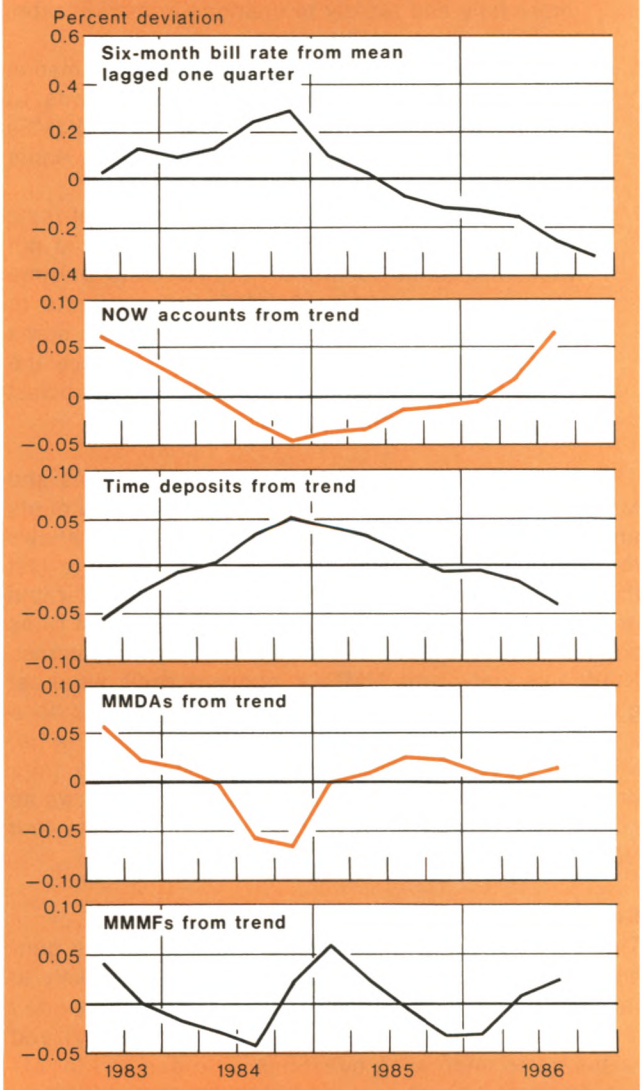
The experience of the last few years offers some general insights into how monetary aggregates are likely to respond to future changes in interest rates (provided that banks continue to behave in the same way) and raises some interesting questions. The demand for M1 has retained a significant, and probably larger, interest rate elasticity even though checking accounts for consumers have been deregulated. The traditional interest-

[9] In practice, some of the rate spreads could probably be eliminated in estimating demand equations. At the minimum, the opportunity costs with respect to market instruments and the other components of M2 should be included in each equation. Hence, for the MMDA and Super NOW equations, it probably would not be necessary to include both the spread with time deposits and MMMFs since both of these are components of M2 and fully adjust to changes in market rates with a similar pattern. That is, either rate spread could be used as a general proxy for the spreads that fully adjust to changes in market rates. In the case of Super NOWs, however, serious multicollinearity problems would still remain, whereas for MMDAs the problem would be considerably reduced. In some cases, taking the first differences of the spreads tends to reduce the degree of correlation somewhat, but in other cases it becomes greater.

rate channel is still open whereby movements in market rates cause changes in the desired level of transactions balances by affecting the spread between market rates and the rate paid on M1. In addition, the deregulated environment has provided a new channel through which changes in market rates can narrow or widen the spread between the time deposit rate, as well as the MMDA and MMMF rates, and the rate on transactions balances. Since many of these flows are within M2, M2's interest responsiveness has not been increased. Indeed, it probably has been considerably reduced compared to a regulated environment, because to an increasing degree the rates paid on its components respond at least partially (and time deposits and MMMFs fully) to changes in market rates.

Chart 7

Response of Deposit Flows to Movements in Interest Rates



While the experience of the last three years can provide some insights, interest rates have not moved over a sufficiently large range in both directions for there to be much confidence that the process by which these rate spreads are affected is well understood. Indeed, it is likely that banks have been learning how to price consumer deposits in a deregulated environment over these last few years, and that as they gain more experience they may behave in a different way. In the same way, consumers will become more familiar over time with deregulated deposits and could respond differently in the future. And both banks and consumers might not respond as strongly if rates were gradually increasing rather than falling by a large amount as they did over the past few years in response to the sharp fall in the rate of inflation. In other words, their response might not be symmetrical to rising and falling market rates, or to gradual rather than large changes in market rates. Moreover, we have no experience with how banks and consumers might behave in a situation where the yield curve for market instruments became inverted.

And even in a stable interest rate environment, banks may find it profitable to reprice these various accounts, thus affecting M1 as well. For example, if banks begin to believe that a large volume of the funds held in NOW accounts are relatively inactive savings balances that have been shifted into NOW accounts as interest rates fell, they may design combinations of accounts with transfer features that would induce consumers to hold these inactive savings balances in nontransactions accounts in order to avoid reserve requirements. Then M1 could appear unusually weak relative to GNP for a period of time, instead of appearing unusually strong as it has in recent years when savings balances were added to M1. Indeed, if banks should strongly encourage consumers to keep only frictional transactions balances in M1, M1's interest elasticity could begin to appear very low compared with the experience of the past few years. While we do understand a few features of this new environment, it continues to be important to monitor changes in the banking system that might affect the behavior of the monetary aggregates. There are many reasons to expect that the recent past might not be a good guide to the future.

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