Federal Reserve Bank of San Francisco

Economic Review

Spring 1985

Number 2

The Federal Reserve Bank of San Francisco's Economic Review is published quarterly by the Bank's Research and Public Information Department under the supervision of Joseph Bisignano, Senior Vice President and Director of Research. The publication is edited by Gregory J. Tong, with the assistance of Karen Rusk (editorial) and William Rosenthal (graphics).

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Competition for Money Market Deposit Accounts

by
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The money market deposit account (MMDA) is the first liquid, short-term, small denomination deposit account in recent history to be free from interest-rate ceilings. Introduced in December 1982, it has become a very important source of deposits, with balances currently over the $450 billion level nationally, which represents about 15 percent of total deposits. In this paper, we analyze why the account has been so successful, where the funds in the account came from, how the shift in funds affected banks' deposit costs and how individual banks competed for and priced MMDAs.

The single most important step in the deregulation of interest rates on retail deposits at banks and thrifts was the authorization of the money market deposit account (MMDA) and the Super-NOW account, which were both free of interest ceilings.[1] The volume of funds that moved into MMDAs was staggering: MMDAs grew to over $300 billion (15 percent of total deposits) within three months after their introduction on December 14, 1982. Super-NOW accounts, however, attracted only some $30 billion during the three-month period after their introduction on January 5, 1983.

In this paper, we analyze why and how the MMDA so dramatically altered both depositors' and banks' holdings of deposits and the nature of competition for deposits. Our objectives are to explain why these accounts were so popular, where the funds came from, what determined individual banks' pattern of adoption of these accounts, and how sensitive the quantity of funds in these accounts was to variations in both their own interest rate as well as the rate on substitute assets. Our analysis focuses on the MMDA rather than the Super-NOW because the MMDA's impact on deposit holdings was so much larger.

Money market deposit accounts are an insured, short-term, ceiling-free account with limited transaction features that were, in the language of the authorizing Garn-St Germain Act of 1982, to be ". . . directly equivalent to and competitive with money market mutual funds. . .". However, prior to their introduction, there was considerable uncertainty about the sources and stability of MMDA deposits and how they would be priced. Some thought that MMDAs would attract large quantities of money from the money funds, and there even was speculation about the long-term viability of the money funds given that MMDAs were insured. Others thought that most MMDA deposits would come from other funds already on deposit at banks and thrifts. If large amounts

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of low-interest "core" deposits like passbook savings accounts were transferred into MMDAs, there were fears that banks' and thrifts' deposit costs would rise substantially. There was also uncertainty about how quickly funds would be attracted to MMDAs and whether they would be responsive to minor rate changes (as are large, $100,000 and over, Certificates of Deposit, CDs), allowing individual institutions to increase their market shares by slightly outbidding their competitors. Moreover, it was unclear whether the MMDA's rate-sensitivity would change over time—with balances more rate-sensitive during the initial introductory period than once depositors had shifted funds into the new accounts.

We address these issues by analyzing the competition for MMDAs, both among banks as well as between banks and the money funds. Our empirical analysis of these issues utilizes monthly data on the rates and quantities of deposits of MMDAs and other accounts for a sample of 59 banks in the 12th Federal Reserve District. (See Data Appendix.) Data for individual banks, unlike aggregate data, enable us to address questions of interbank competition, which most previous studies of deposit flows cannot.[2] We do, however, use nationwide aggregate data to estimate the flows of funds into MMDAs from the money funds and from other deposit accounts.

Our analysis uses both micro and macro data to estimate the parameters of the supply function of MMDA deposits to banks. Both short- and long-run, own- and cross-price elasticities are estimated. In addition, we analyze the process of adjustment in financial markets both to the introduction of a new account and to changes in rates once the initial adjustment is complete.

The organization of the remainder of this paper is as follows. In Section I, we provide a brief description of the MMDA account and a historical perspective on why it was introduced. Aggregate data for the nation are used to measure flows of funds into MMDAs, both from the money market funds and from funds already on deposit with banks and thrifts. Section II outlines a theory of banks' demand for MMDA deposits and the nature of deposit adjustment costs. Implications of this theory for the market acceptance and pricing of MMDAs are developed as well. In Section III, the competition for MMDAs is analyzed. First, the time pattern of adoption of MMDAs is modeled as a function of banks' characteristics and pricing strategies. Then, estimates of the short- and long-run, own- and cross-interest elasticities of the supply of deposits to banks are presented. Section IV presents our summary and conclusions.

I. Background

Money market deposit accounts were in part a regulatory/legislative response to the success of the money market funds (MMFs) which, by late 1982, had attracted well over $240 billion, much of it from traditional bank and thrift depositors. Money funds offered significant advantages over the regulated accounts offered by depository institutions (hereafter referred to as banks). First, the funds paid returns to investors near the wholesale money market rate. Yields were determined by the return on the funds' portfolios of short-term money market instruments less a small administrative fee. Second, the funds were generally liquid, allowing investors transaction and check-writing privileges. These features were not available on banks' "money market certificates", a six-month time account with an indexed ceiling rate that yielded only slightly less than a six-month Treasury bill. Third, most funds' minimum opening balance was well below the $10,000 minimum required for banks' six-month "money market certificates" or the $20,000 minimum on 7- to 31-day time certificates. Fourth, the money funds were able to raise "deposits" on a nationwide basis, effectively skirting the prohibition that banks faced on interstate deposit-taking. Finally, MMFs

could be linked with other mutual funds and security transactions.

Because of the money funds' dramatic growth, there was considerable political pressure to allow banks to offer comparable instruments so that they could compete on an equal footing. As it turned out, the MMDA and, to a much lesser extent, the Super-NOW accounts were just such instruments. Without them (or accounts similar to them), it appeared that depository institutions might continue to lose retail deposits to the money funds.

MMDA Terms

Although the MMDA was patterned after the MMFs, there are some differences, primarily regarding reserve requirements and regulatory limitations on transactions and minimum balances. The MMDAs are free of interest rate ceilings as long as a minimum balance of $1,000 is maintained ($2,500 prior to January 1, 1985), and are insured to $100,000. The MMDA is available to all depositors, including individuals, governments, nonprofit institutions and businesses—although non-personal deposits, unlike personal deposits, are subject to a 3 percent reserve requirement. In addition, unlike the money funds, MMDAs have transaction features that are restricted by regulation. Depositors are allowed up to six automatic, telephone or check transfers per month (with a maximum of three check transactions), although withdrawals made in person are unlimited. (See Appendix Table 1 for a detailed description of the characteristics of MMDAs, Super-NOWs and the money funds.)

Sources of MMDA Deposits

Where would the funds for the MMDA come from? In general, funds would be expected to come from other financial instruments that were close substitutes (from both banks' and depositors' perspectives) for regulated retail deposits. Since, at the time of the MMDA's introduction, open-market interest rates had been above the ceilings for a number of years, depositors who did not value the implicit interest in terms of added services would already have moved their funds out of the low-paying retail accounts. Thus, it seemed unlikely there would be a further shift of funds out of low-interest retail deposits, such as passbook savings, into MMDAs.

Rather, the funds for MMDAs, which have limited value as transaction accounts, would come from those sources where depositors had moved them in the first place, to avoid the ceilings. We thus expected particularly large inflows into MMDAs from the money funds. Depositors had shifted balances from regulated retail accounts into the money funds apparently because they viewed them as close substitutes. Moreover, since banks had used large CDs to replace lost retail deposits, we expected declines in these balances as well. Also, to the extent that the ceilings had induced depositors to move funds into other near ceiling-free accounts, such as the six-month money market certificate, some of those funds probably also would be moved into MMDAs.

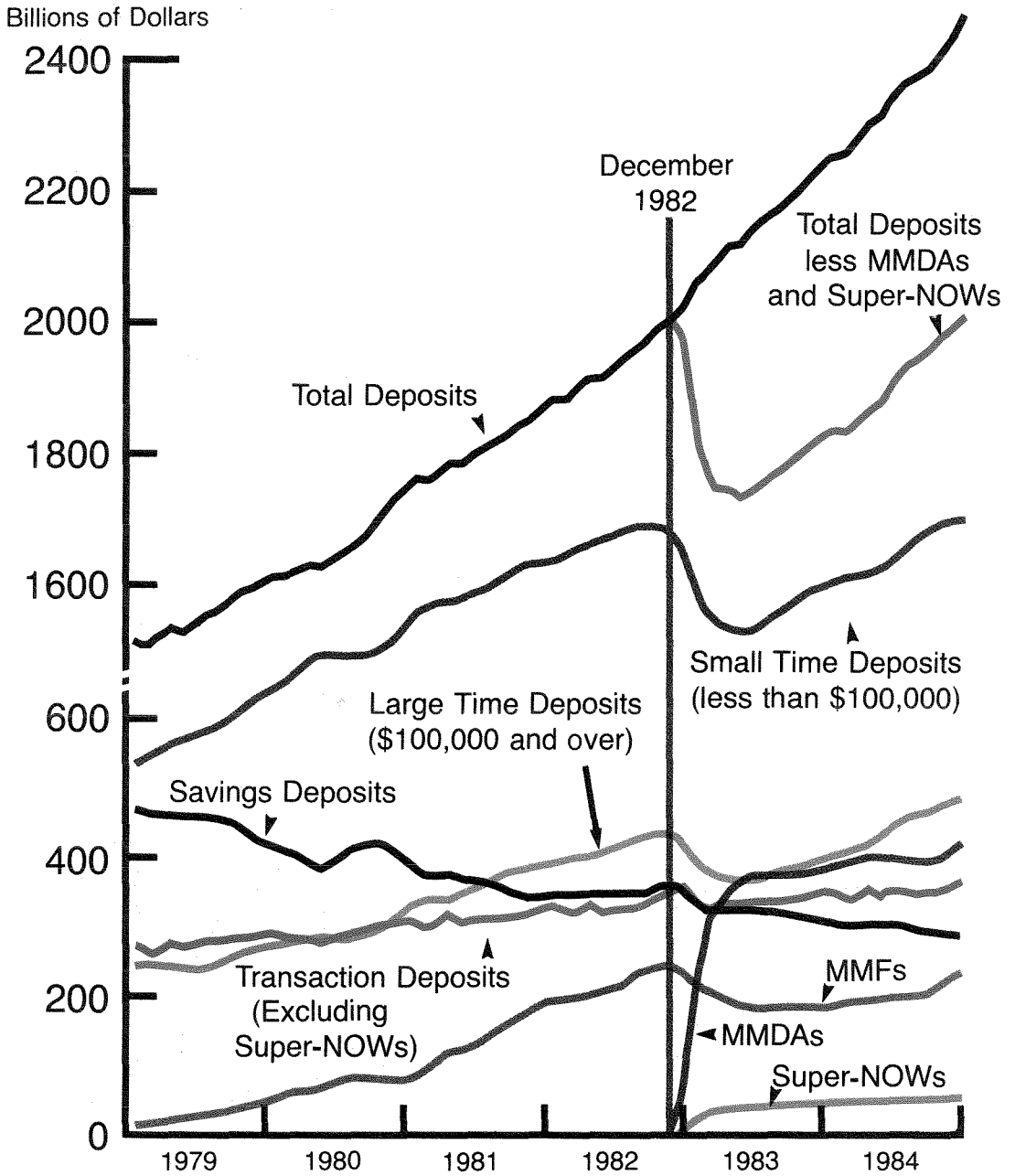
By analyzing the decline in various types of deposits that were contemporaneous with the MMDA's initial rapid deposit growth, it is possible to infer which types of deposits were probably the most important sources of MMDA funds. For banks and thrifts, aggregate deposit data (at the national level) for small and large time deposits, savings deposits and transaction deposits are analyzed along with data on money funds' assets. In Chart 1, these various deposit stocks are plotted along with MMDA and Super-NOW deposits to indicate which types of deposits fell as MMDAs grew. Also, monthly changes in various types of deposits were regressed on monthly changes in MMDAs (and other control variables) to provide quantitative estimates of the sources of MMDA deposits.[3]

Chart 1 shows that a substantial decline in the money market funds' assets coincided with the growth in MMDAs, suggesting that the money funds were substitutes for MMDAs and thus an important source of MMDA deposits. Similarly, our regression model shows a statistically significant decline of $.24 in money fund assets for each dollar that flowed into MMDAs.

Although the data suggest that the money

Chart 1

Money Market Funds vs. Components of Total Deposits (Combined Bank and Thrift Total)



funds were an important source of MMDA deposits, the money attracted from the MMFs did not lead to a comparable increase in the total deposits of the banking sector. As Chart 1 shows, there was only a slight increase in total deposits after December 14, 1982 despite the influx of funds into MMDAs from the money funds. Thus, the MMDA inflows must have been mostly offset by outflows from other types of deposits. In particular, we would expect some of the funds in banks' large CDs to leave the banking sector as money funds' assets ran off. In part, this is because of the direct effect of a reduction in the money funds' holdings of banks' CDs as the money funds contracted. Moreover, as banks experienced rapid inflows into MMDAs, they would reduce their purchases of relatively more expensive CDs, and some of the previous holders of large CDs would move their funds out of banking deposits. We find that there was indeed a statistically significant decline in large time deposits (CDs) of $.42 for each dollar increase in MMDAs. This drop was considerably larger than the decline in the money funds' assets.

This rather massive substitution of retail MMDAs for wholesale CDs has important implications for bank costs. Since MMDAs, like other retail deposits, are generally less costly than large CDs, this shift alone lowered banks' deposit interest costs. The inflow from money funds also has implications for their long-run viability. Although we estimate that MMDAs attracted nearly $90 billion from the money funds, this appears to have been a one-time shift since the money funds have continued to grow despite competition from the MMDA. Indeed, MMF assets have rebounded to near their pre-MMDA peak.

There was also a dramatic, statistically significant decline of $.52 in small-denomination (less than $100,000) time deposits for each dollar increase in MMDAs. After an actual decline of nearly $150 billion over a six-month period, small time deposits resumed their trend growth rate as the growth in MMDAs tapered off. This pattern suggests that there was a one-time shift of funds. The largest decline in the small time category took place in the popular six-month money market certificate, which already paid a near (wholesale) market rate of interest, but tied funds up for six months.

The impact of the switch from small time accounts to MMDAs on the cost of funds was probably not too large for many institutions. Nearly all of the funds in the small-time category were already paying near open-market rates or were tied to those rates by the end of 1982. Still, even though this switch did not directly alter the cost of these funds substantially, it changed the overall composition of deposits and shortened the (stated) maturity distribution for retail deposits.

Both savings (passbook accounts, at the time paying 5¼ percent at banks and 5½ percent at thrifts) and transactions balances—including demand deposits, Negotiable Orders of Withdrawal (NOW) and Automatic Transfer Service (ATS) accounts, and savings deposits authorized for telephone and preauthorized transfers, but excluding Super-NOWs—also appeared to fall slightly during the months following the authorization of the MMDA. However, the regression analysis does not provide evidence of a statistically significant shift. It is likely that the declines did not represent actual shifts because of build-ups (evident in Chart 1) in both savings and transactions balances in the weeks preceding the authorization of the MMDA. Knowing that banks would be authorized to offer these short-term market rate accounts as of December 14, many depositors with maturing instruments likely held funds temporarily in transaction or savings accounts until the new accounts were available.

The lack of a significant shift from savings accounts into MMDAs suggests that (passbook) savings accounts must be offering a large service benefit that offsets the binding effect of the interest ceiling. (The effect of binding interest ceilings is discussed in the Box.) This confirms our hypothesis that the gradual erosion of these accounts had left mainly depositors that prefer implicit interest in the form of non-taxable services rather than taxable interest. Our findings are consistent with evidence provided by Furlong (1984) that savings accounts—through

The Effect of Interest Rate Ceilings on Deposit Costs

To see why interest ceilings actually led to higher average and marginal deposit costs for banks operating in competitive deposit markets, consider the following analysis. A bank can "produce" or attract a given quantity of deposits, Q_O, by varying the relative amounts of unpriced service and interest payments it makes to its depositors. Such a tradeoff between interest and service payments is depicted in Figure 1.

At very low service levels, consumers are willing to give up a dollar of interest for less than a dollar of services, that is, services that cost the bank less than a dollar to provide. This is because of tax considerations (interest payments are taxable and service payments are not), the joint production of interest and services, and because of the transactions costs associated with buying or paying for each service separately. However, because of diminishing marginal utility, as service levels increase, consumers are willing to forego less and less interest per dollar of services. Thus, at high service levels, consumers are willing to give up a dollar of interest only in return for more than a dollar of extra service.

A bank seeks to minimize the cost of attracting a given quantity of deposits. The bank's cost of a given quantity of deposits is simply the sum of its interest and service payments, which is depicted as the 45° line in the figure. The minimum-cost combination of interest and service payments to attract Q_O deposits is given by the point of tangency in Figure 1, where the consumer is willing to forego a dollar of interest for a dollar of services. This is equal to the tradeoff the bank faces in providing interest and services.

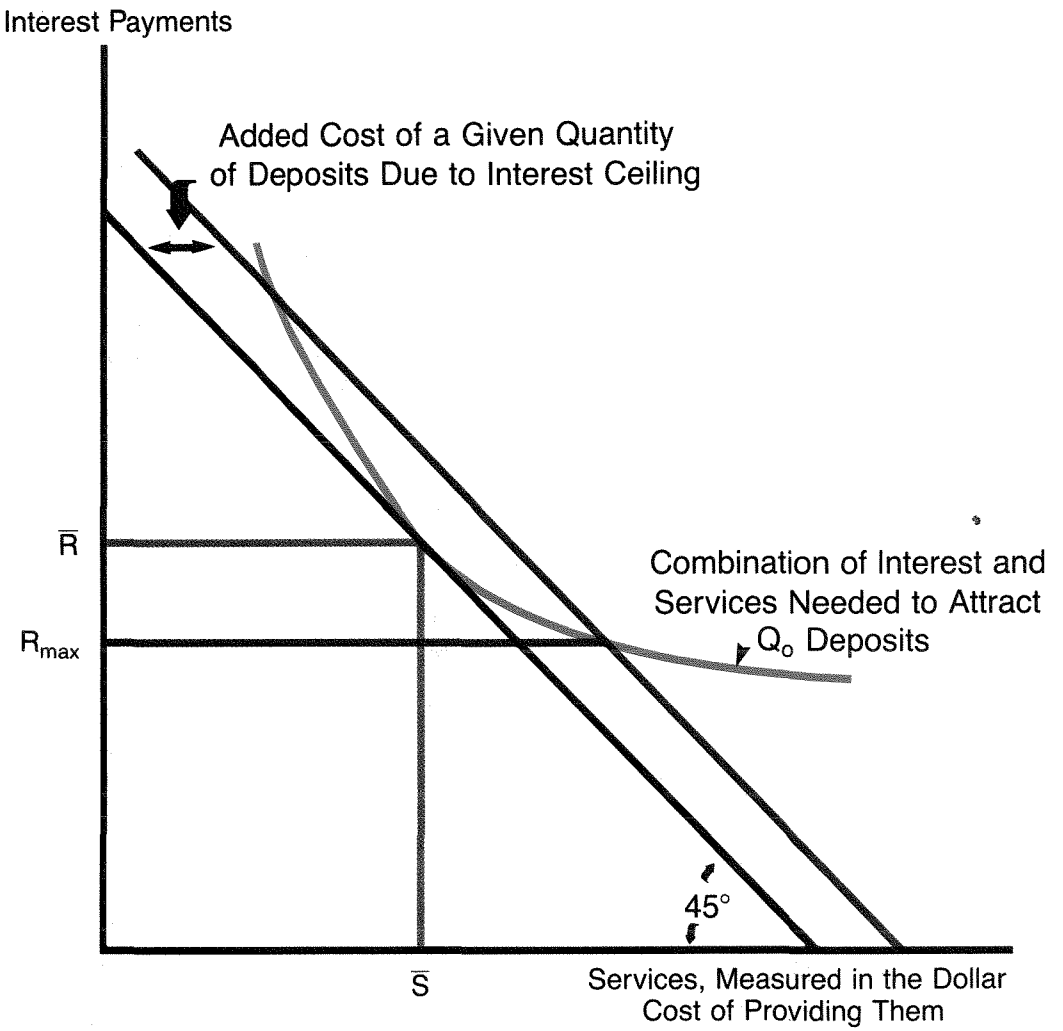
However, if an interest ceiling is imposed that limits interest payments to be less than $\overline{R}$—the interest the bank would have paid in the absence of ceilings—then the bank will be able to attract the same quantity of deposits only by offering services in excess of $\overline{S}$. Since a unit of these added services will be valued at less than a dollar even though they cost a dollar to provide, the bank will face higher total costs of attracting the same quantity of deposits. That is, average deposit costs will rise. It can be shown that the marginal cost of deposits will also rise. Thus, this analysis shows that ceilings that cause banks to pay less interest than they otherwise would leads to an inefficient substitution of service for interest payments and causes the average cost of deposits to rise.

A similar type of analysis can be performed for banks with access to wholesale markets for funds (the large CD market). The tradeoff between wholesale and retail deposits is similar to that depicted in the figure between interest and service payments. This is because there are costs of size intermediation that prevent wholesale deposits from being perfect substitutes for retail deposits. (Perfect substitutability would mean a linear tradeoff and also that banks would not take any retail deposits when ceilings are imposed.) Thus, interest ceilings force banks, which have access to wholesale markets, to rely more heavily on wholesale deposits than they otherwise would. Thus, the ceilings drive up the average and marginal costs of banks' deposits.

Since MMDAs have no interest ceilings, they reduce the average and marginal costs of deposits for banks constrained by ceilings in competitive markets. Thus, both banks and depositors have substantial incentives to switch funds into MMDAs.

Figure 1

Tradeoff Between Services and Interest Needed to Attract a Given Quantity of Deposits



high turnover—provide a substantial transaction service component different from that offered with MMDAs. Thus, the nearly $290 billion in savings deposits currently on the books are not likely to be shifted suddenly out of savings in response to higher returns on MMDAs.

Surveys of the sources of MMDAs made during the rapid growth period provide results similar to those discussed above, although most indicate a higher proportion of new funds.[4] As previously discussed, our evidence suggests that although a significant fraction of MMDA deposits were attracted from the money funds, these inflows were offset by outflows from other deposits. Although MMDAs apparently had only a minor impact on total deposit growth, they significantly altered institutions' mix of deposits—increasing retail deposits at the expense of wholesale deposits—and they were successful in allowing banks to compete with the money market funds for retail deposits.

II. Market Adjustment

In theory, the growth of funds in MMDAs would be determined jointly by households' and banks' portfolio decisions. Banks, within the limits imposed by competition, would set the rates (and other terms) on these accounts, and consumers could reallocate their portfolios in response to those rates subject only to the costs of such reallocations. Banks, of course, might try to take into account households' responsiveness to interest rates when setting rates, but households' reallocations might also depend on their expectations about how banks would price these accounts in the future. Furthermore, information and other unique transaction costs associated with moving funds into MMDAs might significantly affect the flow of MMDA funds.

Banks' Demand for MMDAs

Interest ceilings had led banks that were in competitive markets to substitute nonpriced services for interest payments and wholesale deposits for retail deposits. By allowing banks to attract funds directly through price competition, MMDAs were a lower cost means of attracting funds than had existed previously.[5] (See Box.) This regulatory innovation lowered the average and marginal costs[6] of attracting deposits and simultaneously increased the effective rate paid to depositors, and thereby provided a strong incentive for banks to attract funds into these accounts as well as a strong incentive for depositors to shift funds into these accounts.[7]

MMDAs' very rapid acceptance by the marketplace confirms that there were substantial cost savings for banks in offering such accounts and that depositors preferred the combination of explicit interest, maturity and services offered by MMDAs to those available on at least some pre-existing accounts. However, because both banks and depositors would probably experience adjustment costs associated with opening such accounts and shifting funds into them, the adjustment of actual to desired stocks of funds in these accounts would not be instantaneous. These adjustment costs have a number of important implications discussed below.

Adjustment Costs

As Flannery (1982) and others have shown, the existence of bank-specific transaction and information costs mean that retail deposits have a specific capital component making them a "quasi-fixed" factor of production.[8] That is, retail deposits are somewhat like specific human capital in that the transaction and informational costs involved in opening an account are largely specific to the bank in question. For example, a consumer must invest time to learn about a bank's rate, location and procedures, and must fill out various forms to open an account. Most of this investment, however, becomes worthless if the consumer switches to another bank or investment alternative.

As Becker (1962, 1964) has shown in the human capital context, the cost of specific investments will be shared. If banks paid the full costs

(and received the returns) of the specific investment associated with opening accounts (by compensating depositors for the time and money costs of opening accounts), customers could switch accounts with no cost to themselves and therefore would not take into account these bank-specific investment costs. Banks, in turn, would earn no return on their investment in set-up expenses. Conversely, if depositors bore the entire (time and money) cost of setting up an account, banks could lower the rates paid without taking into account the lost investment the depositor would incur in switching accounts. The theory of specific capital investment predicts, therefore, that the costs of specific capital investments will be shared by both parties so that they both at least partially take into account the effects of their behavior on these specific investments. Thus, when an investment has a strong specific capital component, as does opening an MMDA account, the trading parties share the costs of the specific investment. This sharing, in turn, provides both parties with an incentive to continue their relationship to protect their investment.

These shared costs of setting up new accounts mean that both banks and depositors face adjustment costs when shifting deposits into MMDAs. For example, if a bank wishes to attract more deposits (at least partially through deposits into new accounts), it must bear part of the initial set-up costs as well as pay explicit interest. Depositors also bear part of the initial set-up costs. Adjustment costs for depositors lead to differences in the short- and long-run interest elasticities of the supply of deposits to banks, and imply it takes time for actual stocks to adjust to changes in desired deposit stocks. Similarly, adjustment costs for banks imply differences in bank's short-run and long-run interest elasticities of the demand for deposits.

As Flannery (1982) points out, these adjustment costs can lead banks to pay rates of interest on deposits in excess of their marginal revenue products in the short-run when demand temporarily declines, and to pay less than the marginal revenue products when demand temporarily increases, in order to minimize adjustment costs. Over a long-run period, however, deposit costs are equated (on average) to marginal revenue products. Flannery also notes that if non-retail deposits, such as CDs, have no or very small specific capital costs, then banks will use these instruments to meet temporary fluctuations in demand. Thus, it will be occasionally worthwhile for banks to pay higher rates on retail deposits than on wholesale funds such as large denomination CDs to avoid the adjustment costs associated with changing the level of retail deposits.

Adjustment costs are likely to be important for all types of retail deposits regardless of whether they are newly authorized accounts. However, unlike existing accounts in which one can simply deposit a check, virtually all MMDA deposits in the first few months were new deposits with the associated bank-specific set-up costs. Because of this, banks could partly compensate depositors for the costs of opening a new account by paying high interest rates initially. However, for a short-term account like the MMDA, this strategy is not cost-effective once a substantial number of new accounts are opened since high rates would have to be paid to both new and existing accounts. Thus, one strategy for banks would be to pay high rates initially to partly compensate depositors for the initial bank-specific set-up costs, but to compensate depositors in some other way for the costs of opening a new account once the rate of new account formation slowed.

This specific-capital theory of retail deposit flows implies that the cost and quantities of such deposits will respond sluggishly or incompletely to changes in wholesale market interest rates. As Flannery and James (1984) point out, this means that the effective maturity of a bank's retail liabilities need not equal their stated maturity (or time to repricing). Thus, retail deposits will not be supplied perfectly elastically, and the short-run interest elasticity of the supply of deposits to banks will be considerably less than the long-run elasticity.

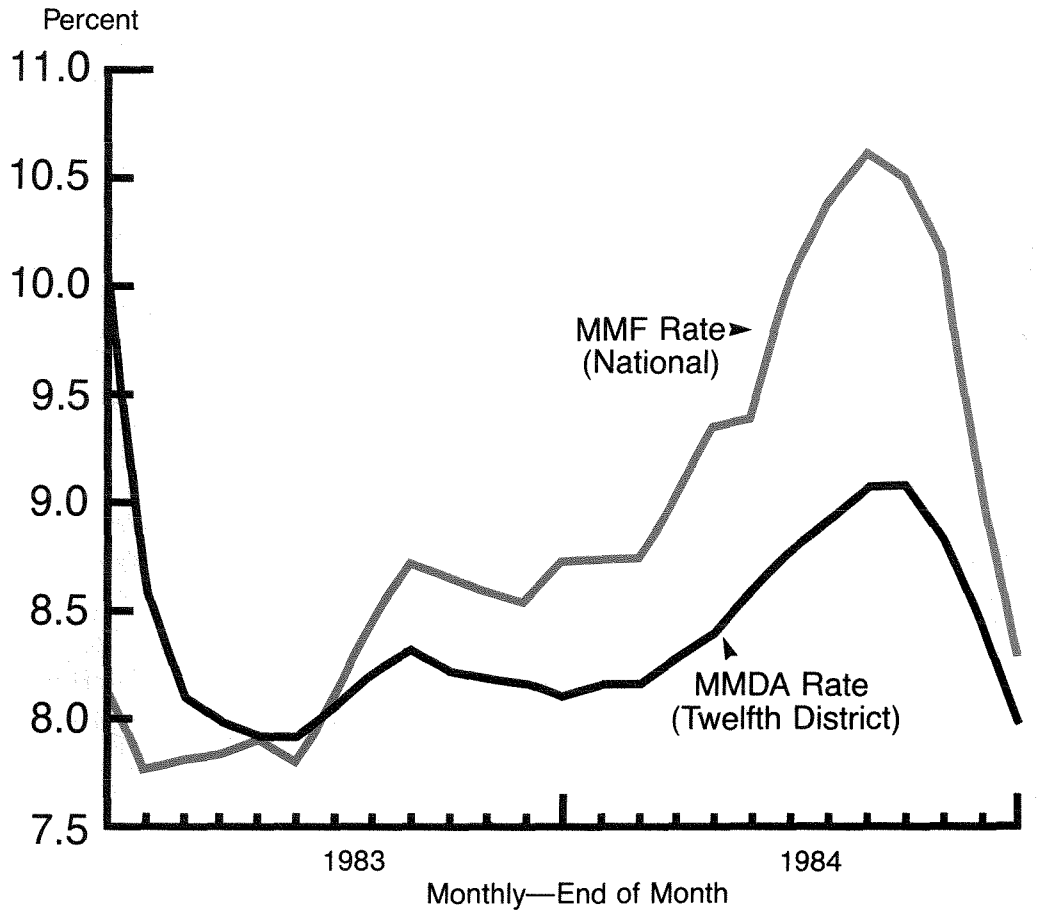
The Market Acceptance of MMDAs

When a new cost-saving technology such as the MMDA is introduced, the adoption of that technology is not instantaneous because there are costs in learning about the technology as well as costs involved in actually adopting the new technology. The rate at which a new technology is adopted depends on the cost-savings it affords compared to the information and other adjustment costs of adopting it. Although it appeared to take MMDA deposits 3 to 4 months to reach an equilibrium (see Chart 1), approximately 80 percent of banks nationwide offered MMDA accounts starting on December 14, when they were first authorized (and which was only two months after the enabling Garn-St Germain Act was passed). Thus, the costs associated with offering them must have been greatly exceeded by the expected returns. However, the costs associated with opening an MMDA account must have been significant since it took at least three months for deposits to reach an "equilibrium" level.

Banks apparently expected substantial long-run cost savings by attracting funds into MMDAs because many institutions waged aggressive promotional campaigns. Many developed concerted marketing efforts to attract funds via television, radio and print media and direct mail. Institutions also employed bonuses

Chart 2

MMF Rate vs. Bank MMDA Rate



for depositors opening new accounts (an incentive to move funds between institutions) and, perhaps most importantly, many offered premium interest rates considerably above money market fund yields. This pricing behavior is consistent with the specific capital model which predicts that the specific capital investment required to open a new account will be shared by banks through high initial direct interest payments, through cash bonuses for opening accounts, or both.

In Chart 2, we plot the average rate paid on MMDAs (in our sample of western banks) and money funds from the end of 1982 to the end of 1984. This chart shows that the rates paid on MMDAs were considerably higher than the money fund rate in December 1982 and January 1983, but that the rates were close by March of 1983. This is the exact pattern—high initial rates followed by declines—predicted by the specific capital model because high interest rates cannot continue to be used to partly compensate depositors for the cost of opening new accounts once a substantial number of new accounts have been opened. After May 1983, the rate on the money funds exceeded that on MMDAs and was considerably more variable. This pattern also is consistent with the specific capital model which predicts that rates on retail accounts will behave more sluggishly than wholesale rates. Also, since MMDAs offer both federal deposit insurance (not available on MMFs) and more convenience features (for example, access through automated teller machines) than money funds, we would expect MMDA rates generally to be lower than money fund rates except during periods when interest rates temporarily decline.

III. Competition for MMDAs

In this section, we analyze the competition among banks for MMDAs. Two broad issues are considered: the determinants of banks' initial patterns of adopting MMDAs and the interest-sensitivity of MMDA deposits. To analyze differences in banks' patterns of adoption of MMDAs, we employ a logistic model of the percent of each bank's total deposits in MMDAs as a function of time. Differences in the banks' parameters of the logistic are then modeled as functions of various bank characteristics and pricing strategies. To analyze the interest-sensitivity of MMDAs, a standard stock adjustment model of MMDA deposits is employed. Short-run and long-run, own- and cross-interest elasticities of the supply of MMDA deposits to banks are estimated.

The Pattern of Adoption of MMDAs

As theory suggests, different banks would adopt different strategies to attract MMDA deposits depending on the expected benefits and costs. Those banks (and depositors) in the most competitive deposit markets would have the greatest incentives to switch to MMDAs because these banks would have experienced the greatest added costs in attracting deposits due to the inefficiencies of non-price competition. They would have, in effect, been paying high rates of interest (explicit plus implicit) on deposits while depositors were receiving low rates because depositors valued the "free" services and convenience at less than their cost. Similarly, banks that had substituted wholesale deposits for retail deposits might have different incentives to shift to MMDA funding than banks that had substituted nonprice competition for price competition. Also, banks may be in different loan markets and thus have different demands for deposits. Finally, banks may be in different markets for other factor inputs, such as labor and real capital, and thus face different prices for other factors of production. These different input prices also would lead to different demands for MMDAs.

To determine whether banks did differ in their strategies to attract MMDAs and what effects these strategies had on the time-pattern of adoption of MMDAs, we employed an empirical strategy first suggested by Griliches (1957) for analyzing the adoption of new technologies.

If, in fact, the costs and benefits of attracting

MMDAs differ among banks, then we should expect differences among banks in the time-pattern of adoption of MMDAs. For banks in the aggregate, there was an S-shaped pattern of adoption (See Chart 1). Although we would expect individual banks to have the same general S-shaped pattern of adoption of MMDAs, the parameters of this function are expected to differ among banks because of differing costs and benefits to them of attracting MMDA deposits.

To determine empirically whether the parameters of this general function do differ among banks, we fit separate logistic functions to each bank's percentage of total deposits in MMDAs over time. The logistic is an S-shaped function that captures the evolution over time in the share of total deposits in MMDAs in each bank. If the parameters of the logistic—which determine its origin, rate of growth and equilibrium percentage—differ substantially across banks, they then can be analyzed as functions of the banks' strategies for attracting deposits to determine how various strategies affected banks' time-pattern of adoption of MMDAs.

The logistic[9] is defined as:

$$P(t) = \frac{K}{1 + e^{-(a+bt)}} \qquad (1)$$

where:

P(t) = the percentage of deposits at time t in MMDAs

K = the equilibrium percentage of MMDAs of total deposits (when $t = \infty$)

b = the rate of growth of the percent of deposits in MMDAs

a = a parameter that positions the logistic on the time scale.

The logistic function, equation 1, is estimated for each of the 59 banks in our sample using the first 12 months of data on deposits. The method of estimation is non-linear least squares (with Gauss-Newton iterative optimization) that enables us to estimate the parameters K, a and b simultaneously. Fits are generally excellent with over 99 percent of the variance explained by the model, and asymptotic t-values of all parameters significant at the 1 percent level or better.

Parameter estimates for a, b and K (available on request) show considerable variation across banks in the time-pattern of adoption of MMDAs. In Table 1, summary statistics for these parameters of the logistic are presented. Comparing the minimum to the maximum, the parameter a varies by over 2 months; the rate of growth parameter b also varies by a factor of 3; and the equilibrium percentage of MMDAs, the parameter K, varies from as low as 7 percent to as high as 35 percent. This wide variation indicates that banks did in fact experience different time-patterns in the adoption of MMDAs.

These results also can be used to compute the time required for MMDAs to reach 90 percent of their equilibrium value by applying the following formula.

TABLE 1

Summary Statistics for the Variation in the Logistic Parameters Across Banks

	Parameter	Mean	Minimum	Maximum	Standard Deviation
a	(origin) (in months)	−2.63	−4.13	−1.34	.74
b	(slope) (percent per month)	1.80	.81	3.08	.62
K	(equilibrium proportion)	.21	.07	.35	.064

$$T^{*90\%} = 1/b \{\log [P/(K-P)] - a\} \quad (2)$$

where: $P/K = .90$

This formula indicates that, for the "average bank" in our sample, MMDA deposits reached 90 percent of their equilibrium level in only 2.7 months, a very rapid rate of adjustment.

To test whether these observed differences in banks' time-pattern of adoption of MMDAs can be explained by differences in banks' strategies, three regressions are performed with parameters of the logistic as the dependent variables. A common set of economic variables, including banks' pricing strategies and other variables intended to capture some of the differences in banks' behavior in attracting MMDA deposits, are the independent variables.

In all three regressions, we allow for parameter differences among the states (in the Twelfth District) by including state dummy variables because banks in different states are likely to be in different deposit and loan markets. We also control for total deposit growth during the year prior to the introduction of MMDAs because it seems likely that banks previously experiencing rapid deposit growth also would experience more rapid MMDA growth. Control variables for the absolute size of the bank, in terms of total deposits in November 1982, the number of branches, and a dummy if the bank has 5 or fewer branches, are also included to capture differences in the nonprice component of payment. The key economic independent variables are the average of the rates offered in the last weeks of December 1982 and January 1983—the average of the initial promotional rates—and the average rate paid during the last weeks of the next 10 months. We expect that banks offering high initial rates would have more rapid initial deposit growth but that the equilibrium percentage of deposits would depend more strongly on the average rate paid over time.

In column 1 of Table 2, we find that banks with more rapid previous total deposit growth also had more rapid MMDA growth, and that the size of the bank in terms of total deposits in November 1982 is also positively related to the growth rate of MMDAs. Banks with more branches experienced less rapid growth of MMDAs perhaps because their greater convenience made them less constrained by interest ceilings and thus less willing to promote MMDAs. As expected, high initial rates on MMDAs did lead to more rapid growth of these accounts, but the average rate paid did not affect growth.

In column 2 of Table 2, the equilibrium percentage of MMDAs is analyzed in terms of the same independent variables. Both Idaho and Utah had significantly smaller percentages of deposits in MMDAs than California. We find that the equilibrium percent of MMDA deposits depends on the mean rate paid over the entire period but not on the initial rates paid in December and January. We also find that banks with a strong wholesale presence initially, measured by the percent of large CDs in total deposits, attracted fewer MMDAs. This might have been expected since banks that focused on wholesale markets probably would be less likely to seek retail deposits.

Finally, in column 3 of Table 2 we analyze the parameter of the logistic that shifts the function horizontally. An increase in this parameter shifts the logistic to the left (and a decrease to the right) indicating an earlier start to whatever pattern of adoption was followed. Banks with more branches did adopt MMDAs earlier. Not too surprisingly, neither the initial nor longer term MMDA rate have a significant effect on when banks adopted the new account.

In sum, this analysis indicates that the adjustment of the market to MMDAs, while rapid, was not instantaneous. This result is consistent with the presence of adjustment costs and differences between short- and long-run interest rate elasticities. Banks that offered higher initial rates attracted MMDAs more rapidly, but the ultimate percentage of their deposits consisting of MMDAs depended on the average rate paid over a longer period of time.

Although this cross-sectional analysis of MMDA deposits does suggest that banks adopted different strategies for attracting deposits and experienced different patterns of acceptance of MMDAs, it does not provide esti-

TABLE 2

Effects of Economic Variables on the Parameters of the Logistic
(Standard Errors in Parentheses)

	Speed of Adjustment	Equilibrium Percentage	Origin
	b	K	a
Number of observations	59	59	59
Standard error of estimate	.52	.05	.63
R^2	.46	.62	.46
Mean value of dependent variable	1.80	.21	−2.63
Intercept	3.57 (5.08)	−.83* (.44)	−7.69 (6.10)
State dummy variables: (California is the omitted category)			
Arizona	.21 (.35)	.043 (.03)	−.09 (.42)
Hawaii	−.35 (.40)	−.026 (.035)	.37 (.49)
Idaho	.031 (.44)	−.078** (.04)	−.15 (.53)
Oregon	−.032 (.38)	−.012 (.033)	.34 (.46)
Utah	.30 (.36)	−.12*** (.03)	−1.01** (.43)
Washington	−.43 (.30)	−.014 (.025)	.53 (.35)
Nevada	−1.51** (.70)	−.012 (.061)	2.31*** (.84)
Total November '82 Deposits	$10.03E^{-8}$** $(4.5E^{-8})$	$7.7E^{-10}$ $(39.4E^{-10})$	$-1.35E^{-7}$** $(.54E^{-7})$
Large Certificate of Deposits/Total Deposits	.33 (.52)	−.16*** (.045)	.10 (.62)
November '82 Deposits/November '81 Deposits	1.45* (.77)	.025 (.067)	−.93 (.93)
Number of Branches	$-5.0E^{-3}$** $(1.9E^{-3})$	$.2E^{-5}$ $(16.3E^{-5})$	$6.7E^{-3}$*** $(2.3E^{-3})$
=1 if 5 or fewer branches	−.35 (.22)	−.008 (.02)	.13 (.27)
A bank's mean MMDA interest rate over Feb. '83–Nov. '83	$-7.9E^{-3}$ $(5.8E^{-3})$	.0012** (.0005)	.011 (.007)
A bank's mean MMDA interest rate over Dec. '82 and Jan. '83	.004* (.002)	$.74E^{-4}$ $(1.6E^{-4})$	$-3.2E^{-3}$ $(2.2E^{-3})$

***Significant at the 1% level
**Significant at the 5% level
*Significant at the 10% level

mates of the short- or long-run cross elasticities with respect to rates on competitive assets (such as the rate on money funds), nor does it provide estimates of the short- or long-run own interest elasticities of MMDA deposits after the initial adjustment occurred. To address these questions, we estimate a stock-adjustment model of the supply of MMDAs to banks by pooling data on our cross-section of banks over time.

A Stock-Adjustment Model of MMDA Deposits

Portfolio theory suggests that the desired stock of a particular asset (MMDA deposits held by households and businesses), A_i^*, will be positively related to its own rate of return and negatively related to the rates of return on substitute assets. Thus,

$$A_i^* = f(r_1, r_2, \ldots, r_i, \ldots, r_n, W), \quad (3)$$

where:

A_i^* = desired holdings of asset i
W = wealth
r_i = expected rate of return on other assets, i.

Because adjustment of actual asset stocks to changes in desired asset stocks is costly, only a fraction of the difference between desired and actual asset stocks will be eliminated each period.[10] Thus, the actual asset stock of MMDAs will behave as follows:

$$\Delta A_{it} \equiv A_{it} - A_{it-1} = \lambda (A_{it}^* - A_{it-1}) \quad (4)$$

where λ is the fraction of adjustment per unit of time of the gap between the desired and actual value of the stock. Rewriting equation (4) gives:

$$A_{it} = \lambda A_{it}^* + A_{it-1} (1 - \lambda) \quad (5)$$

And substituting equation (3) gives:

$$A_{it} = (1 - \lambda) A_{it-1} + \lambda f (r_1, \ldots, r_n, W). \quad (6)$$

In this model, $\delta f/\delta r_i$ is the long-run effect of a change in r_i on the (desired) asset stock (which equals the actual asset stock in the long-run), whereas $\lambda \delta f/\delta r_i$ is the short-run, one-period effect.

In estimating this stock-adjustment model, we assume that the public's supply function of deposits is stable compared to individual banks' demand for deposits, so that the observed variation in interest rates is exogenous. For variation in rates over time, this would seem to be a good assumption, but as the preceding analysis suggests, there is also substantial exogenous cross-sectional variation in banks' strategies for attracting MMDAs.

Our empirical version of equation 6, which represents the supply of MMDA deposits to banks, is as follows:

$$\begin{aligned} \text{Ln}(Q_{it}) &= \alpha + \beta_1 \text{Ln}(Q_{it-1}) \\ &+ \beta_2 \text{Ln}(R_{i,\,\text{MMDA}_t}) + \beta_3 \text{Ln}(R_{\text{MMF}_t}) \\ &+ \beta_4 \text{CONTROL}_i + e_{it} \end{aligned} \quad (7)$$

where:

Q_{it} = The quantity (stock) of MMDA deposits at bank i in month t.
Q_{it-1} = the lagged quantity of MMDA deposits.
$R_{i,\,\text{MMDA}_t}$ = the rate bank i pays on MMDA deposits in month t.
R_{MMF_t} = the average rate on money market funds during month t.
CONTROL = a vector of control variables including: the natural log of total deposits in November 1982, the growth of deposits from November 1981 to November 1982, the percentage of CDs in total deposits in November 1982, the natural log of the number of branches, a dummy for 5 or fewer branches, and dummies for each state in the Twelfth Federal Reserve District with California being the excluded category
e_{it} = a random error term
α, β_s = parameters to be estimated.

This model has four important features. First, as equation 7 indicates, the coefficient of $\ln Q_{it-1}$ is an estimate of $1-\lambda$. Also, the coefficients of the interest rate variables are short-

run elasticities (one-period elasticities), but the long-run elasticities may be found by dividing the coefficients by λ.

Second, in this model, data from individual banks are pooled over time. This means that the error term is likely to contain a bank-specific permanent component reflecting permanent unmeasured characteristics of the bank. As Balestra and Nerlove (1966) discuss, such a permanent component can cause bias in models like this one with lagged dependent variables because the lagged dependent variable captures the permanent component. To address this problem, we include a variety of control variables including the size of the bank, both in terms of deposits and branches in the month prior to the introduction of MMDAs, the growth of the bank during the year preceding the introduction of MMDAs, the percent of CDs in total deposits in the month prior to the MMDA introduction (to proxy for the bank's retail presence), and a set of state dummies to capture remaining differences in the state market and regulatory environment not captured by the other variables. We hope that by including these control variables most of any permanent component of the error term will be eliminated. In addition, the effects of the control variables are of interest in their own right.

Third, we apply this general model to three different periods: the entire period, the initial adjustment period following the introduction of MMDAs, and the post-adjustment period. These distinctions were made because the logistic analysis suggests that the flow of deposits into MMDAs was much different during the first three months after their introduction than once they had reached an "equilibrium" level. Thus, it is likely that both the own-and cross-interest elasticity of supply of deposits, as well as the speed of adjustment, would differ during the adjustment and post-adjustment periods.

Finally, the functional form of the model is log-log. This functional form has several advantages when bank-level data are used. With this form the coefficients of the interest rate variables can be directly interpreted as elasticities. More importantly, since the banks in our sample vary widely in size (by several orders of magnitude), the constant-elasticity functional form is superior on a priori grounds to the linear form. This is because it is highly unlikely that a 1 percentage point increase in the MMDA rate would have the same absolute effect on MMDA deposits in a $20 billion dollar bank as in a $20 million bank. By using the constant elasticity, log-log functional form, in which all analysis is in percentage terms, this problem is avoided.

In Table 3, coefficient estimates of the model described by equation 7 are presented. In the first column, results are presented for the entire period. The fit is very good and most coefficients are significant at the 1 percent level or better. Generally, there are significant differences between several states and California in the intercept of this model. These differences suggest that MMDAs during the initial adjustment period were more popular in California than in Idaho, Nevada, Oregon, and Utah (holding constant all other variables in the model). This may be because the California banking market is more competitive.

The results for the entire period (Column 1) also suggest that the initial size of the bank (before MMDAs were offered) was an important determinant of MMDAs, with an elasticity of November 1982 total deposits of .30. That is, banks with 1 percent greater total deposits attracted .30 percent more MMDAs, all other things equal. However, as the results in column 3 suggest, this effect of initial deposit size was much smaller (about one-tenth as large) during the post-adjustment period.

In December, banks with larger branch networks were more successful in attracting MMDAs. However, there was not a significant relationship between the number of branches and MMDAs in either the post-adjustment or adjustment periods.

Banks experiencing rapid growth in deposits prior to the introduction of MMDAs also appear to have attracted more MMDAs (although the result is not consistent across all time frames). This result is not surprising since banks situated in rapidly growing markets might also experience more rapid MMDA growth.

TABLE 3

Analysis of the Quantity of MMDA Deposits at Banks Over Time
(Standard Errors in Parentheses)

	January '83 December '84	January '83 February '83	March '83 December '84	December '82
Number of observations	1416	118	1288	59
Standard error of estimate	.12	.15	.043	.48
R^2	.996	.995	.9995	.96
Mean of dependent variable	11.83	11.56	11.86	10.48
Anti-log of mean ($1000s)	$137,749	$104,820	$141,492	$35,596
Intercept	−4.81***	396.06***	.08	−22.19**
	(.41)	(58.38)	(.19)	(9.76)
State dummies (California excluded)				
Arizona	.03***	.0038	.006	.58*
	(.01)	(.06)	(.005)	(.29)
Hawaii	−.02	−.15**	.001	−.085
	(.02)	(.06)	(.006)	(.30)
Idaho	−.17***	−.22***	−.006	−.041
	(.01)	(.07)	(.006)	(.41)
Nevada	−.10***	−.37***	−.002	−.72
	(.03)	(.12)	(.01)	(.56)
Oregon	−.05***	−.17***	.002	.62*
	(.01)	(.06)	(.005)	(.34)
Utah	−.24***	−.21***	−.01	−.97***
	(.01)	(.07)	(.006)	(.30)
Washington	−.07***	−.14***	−.0005	.11
	(.01)	(.05)	(.004)	(.26)
Ln (Nov. '82 Deposits)	.30***	.38***	.03***	.56***
	(.01)	(.04)	(.005)	(.17)
Nov. '82 Deposits/Nov. '81 Deposits	.15***	.033	.02*	1.087
	(.03)	(.16)	(.01)	(.71)
Large CDs/Total Deposits, Nov. '82	−.28***	.46***	−.05***	.71
	(.03)	(.13)	(.01)	(.59)
Ln (Number of Branches)	.04***	−.052	.0001	.52***
	(.01)	(.043)	(.004)	(.18)
=1 if 5 or fewer branches	.002	.08	.006	−.023
	(.01)	(.06)	(.005)	(.26)
Ln (Lagged MMDA quantity at Bank i)	.67***	.65***	.97***	
	(.01)	(.04)	(.005)	
Ln (Rate on MMDAs at bank i at time t)	1.56***	.08	.19***	3.18**
	(.08)	(.28)	(.04)	(1.32)
Ln (Rate on MMFs at time t)	−.86***	−.60***	−.21***	
	(.04)	(.09)	(.02)	

The coefficient of the lagged dependent variable does suggest that adjustment is not instantaneous and hence not costless. However, during the initial adjustment period (Column 2), the estimates suggest that an adjustment of about 35 percent of the difference between actual and desired stocks occurred per month. This result indicates that over 70 percent of the adjustment to the new equilibrium occurred within 3 months. This rate of adjustment is not too different, although it is somewhat slower, than that obtained from the logistic analysis. However, during the post-adjustment period (Column 3), adjustment is much more sluggish, with an implied rate of only 3 percent per month. This result also is consistent with the notion that the costs of setting up new accounts are much different than the costs of adjusting deposit balances in existing accounts. In fact, the bank-specific capital model predicts that once new accounts are established, both banks and consumers will behave in such a way as to make relatively few adjustments in the quantity of funds in the accounts. This would lead to high serial correlation and a slow adjustment.

The own interest elasticity for the entire period (Column 1) suggests that the accounts were sensitive, at least in the long-run, to the rate paid on them. For example, the short-run elasticity was 1.56 and the long-run elasticity 4.73. However, it should be noted that these are firm-level elasticities that are expected to be large in competitive markets.

During the post-adjustment period (Column 3), MMDAs were much less interest-sensitive, with a statistically significant short-run own elasticity of about .19. Also, during this period, the estimated speed of adjustment was dramatically less—only 3 percent per month. This result is not unexpected given the existence of bank-specific capital costs. However, even during this period, the long-run elasticity was approximately 6.33.

To see whether the high initial rates were successful in attracting MMDAs, the model without the lagged dependent variable (which is minus infinity) and the money fund rate (which is constant in any one month) is estimated for December (Column 4). The results suggest a very high initial interest elasticity of over 3. That is, banks with 1 percent higher MMDA rates attracted over 3 percent more MMDA deposits by the end of December.

The results in Table 3 also suggest that money funds provide important competition to MMDAs. We find a statistically significant short-run cross elasticity of MMDAs with respect to rates paid on money funds of about .21 (Column 3), confirming that these two accounts are substitutes. This result is consistent with the sizable initial runoff of money funds into MMDAs.

The money fund rate in this model, however, plays a dual role. Although it is a measure of the return on an alternative substitute asset, it is also a proxy for market rates in general. Thus, we probably have overestimated the cross elasticity of money funds with MMDAs because a higher money fund rate may simply indicate high MMDA rates being paid at other banks. Attempts to measure the effects of both the money fund rate and the average rate of MMDAs proved unsuccessful, probably because of the high correlation and limited independent variation in these two rates.

One of the major uncertainties surrounding the introduction of the MMDA was its interest-rate sensitivity. If MMDAs were very sensitive to interest rates, banks could attract inflows with marginally higher interest rates and MMDAs would be a relatively unstable and costly source of funds whose rate would behave very much like rates on money funds, or other wholesale market return instruments.

If, on the other hand, MMDAs were relatively insensitive to interest rates, then deposits would be less likely to shift from institution to institution without large or permanent rate differences. Thus, institutions potentially would benefit by having a stable source of retail funds whose effective maturity exceeded its stated maturity and whose cost varied much less than wholesale deposits.

Although our results suggest that MMDAs are quite interest-sensitive in the long-run, they also support the notion that MMDAs are not

very interest-sensitive in the short-run. Thus, MMDAs appear to behave more like retail deposits with a significant bank-specific capital component than wholesale deposits such as large CDs.

IV. Summary and Conclusions

In this paper, the competition for MMDA deposits—both interbank as well as with the money funds—is analyzed. The analysis focuses on four areas: (1) the sources of the MMDA deposits, (2) the pattern of adoption by banks and the public of these new accounts, (3) the pricing of these accounts and (4) the interest-sensitivity of these accounts in both the short- and long-run and with respect to their own rate as well as the rates on money fund assets. Several findings emerged.

The MMDA deposits came primarily from the money funds, small time deposits, and large CDs. Although MMDAs attracted approximately $90 billion from the money funds, the money funds have continued to prosper in the face of competition from the MMDAs. The MMDA did not, on average, appear to lead banks to increase the overall quantity of their liabilities substantially, but it did enable them to increase substantially their quantity of retail deposits thus reducing their dependence on wholesale deposits (large CDs). To the extent that banks' primary comparative advantage is in providing intermediation services at the retail level, the MMDA has enabled banks to strengthen greatly their competitive position in the retail deposit market. By reducing their reliance on purchased funds, it may actually have improved their ability to borrow in the wholesale markets as well.

This suggests that banks' primary responses to Regulation Q were to substitute wholesale for retail deposits, and nonprice competition for direct price competition in attracting funds to these accounts. Both responses apparently increased banks' deposit costs.

The facts that the money funds lost only a fraction of their deposits to the MMDAs and that their cross elasticity was statistically significant but not too large suggest that the money funds and MMDAs are substitutes, but not as close substitutes as some had anticipated. This is not surprising since money funds had taken numerous actions aimed at reducing potential outflows. With the authorization of the MMDA, many money funds lowered their minimums to well below the statutory MMDA minimum, and increased the services their products provided, for example, by linking accounts to brokerage services and providing easy access to other funds (often called families of funds), and by specializing in short-term investments in tax-exempt securities, riskless securities or high risk/high return securities. We also find in our analysis of aggregate data that because the MMDAs are not substitutes for transaction accounts, there is little reason to expect them to have affected the M1 measure of the money stock.

The adoption of MMDAs was very rapid. Most banks offered such accounts on the day they were authorized and the quantity of funds in these accounts reached over 90 percent of its equilibrium value within 3 months. The rate of adoption by depositors depended on the initial promotional rates offered by banks whereas each bank's equilibrium percentage of deposits in MMDAs depended on the average rate paid over a longer period of time.

Most banks paid very high initial rates on MMDAs, but once the rate at which new accounts formed declined, rates dropped below the level offered by the money funds. This type of pricing behavior is consistent with large bank-specific set-up costs associated with opening new accounts. Theory predicts that such specific capital costs will be shared by banks and their customers and high initial rates are one way of doing this. In addition, the rates paid on MMDAs have been less volatile and generally below wholesale rates after the initial adjustment period—a type of pricing behavior also consistent with the specific capital model.

The speed with which MMDAs were adopted suggests that depositors viewed them as being superior to existing retail accounts, especially small time accounts (from which a significant fraction of the funds came). The fact that banks promoted these accounts so widely and paid such high initial rates suggests that banks had faced substantial costs in their nonprice competition for retail accounts and in their substitution of wholesale for retail accounts to mitigate the economic forces of disintermediation due to Regulation Q.

The MMDAs were fairly interest-sensitive (even in the short-run) during the initial promotional period and this quality made the initial adjustment of actual to desired asset stock levels rapid. However, once MMDAs reached an equilibrium level, further adjustment was much slower because of the existence of significant bank-specific capital costs. These costs meant that, once accounts were opened, deposits would shift only slowly in response to interbank interest differentials. This implies that the effective maturity (or duration) of MMDAs is considerably longer than their stated maturity, or time to repricing.

In sum, MMDAs have been an important innovation in the retail banking market. They have offered retail customers a more valuable package of explicit compensation and implicit services than had existed previously. On the banking side, banks have been able to substitute retail for wholesale deposits and price competition for nonprice competition, thus securing a more stable and lower cost source of deposits.

Data Appendix

Data analyzed in this study were collected by the Federal Reserve Bank of San Francisco's Statistical and Data Services Department for the *Monthly Survey of Selected Deposits and Other Accounts* (FR 2042) and the *Report of Transaction Accounts, Other Deposits, and Vault Cash* (FR 2900) reports. The FR 2042 data are collected from a stratified sample (by size) of sixty-four banks in the eight western states. Total time deposits of these banks account for about eighty-two percent of the total time deposits of all insured banks in the Twelfth District. Both outstanding dollar amounts as of the last Wednesday of the month, and the most common interest rate paid during the week ending on the last Wednesday of the month, are reported for a number of deposit categories, including MMDAs, Super-NOWS and several other time certificate categories. Additional deposit data for these banks were taken from the daily FR 2900 report. In particular, total domestic deposits, and total large denomination time deposits were used as control variables in the study.

Aggregated bank and thrift data for the nation were provided by the Division of Research and Statistics, Board of Governors of the Federal Reserve System. Data were not seasonally adjusted, and most are available from the Board of Governors' H.6 press release entitled *Money Stock Measures*. For our analysis, the large time deposits series used was the gross series, which includes money market fund and thrift holdings of large certificate of deposits.

Additional information on money market fund rates, and bank and thrift interest rates were taken from *Donoghue's Moneyletter* and the *Bank Rate Monitor* respectively.

Bank structure and branch measures are derived from the annual Summary of Deposits Survey taken by the Federal Deposit Insurance Corporation, and published yearly under the title, *Data Book, Operating Banks and Branches.*

APPENDIX
TABLE 1

Features	Account Type		
	Money Market Deposit Account (MMDA)	Super-NOW Account	Money Market Mutual Fund (MMF)
ELIGIBILITY:			
Individuals	Yes	Yes	Yes
Business	Yes	No	Yes
Non-Profit	Yes	Yes	Yes
Government	Yes	Yes	Yes
MINIMUM BALANCE:			
Before Jan. 1, 1985	$2,500	$2,500	$1 and up
Jan. 1, 1985 to Jan. 1, 1986	$1,000	$1,000	$1 and up
INTEREST RATE:	Set by Institution	Set by Institution	Determined by return on fund's portfolio
INSURANCE:	Insured by FDIC or FSLIC	Insured by FDIC or FSLIC	Not Insured*
RESERVE REQUIREMENTS:			
Personal Accounts	None	12%	None
Non-Personal Accounts	3%	12%	None
TRANSACTION FEATURES (Number per month:)			Varies, but most are:
Total Transactions (Including Checks)	Six	Unlimited	Unlimited
Maximum Check Transactions	Three	Unlimited	Unlimited
In Person Transactions	Unlimited	Unlimited	n/a
MINIMUM DEPOSITS:	No statutory minimum	No statutory minimum	Varies, $1 and up
MINIMUM CHECK:	No statutory minimum	No statutory minimum	Varies, $1 and up

*At present only a few money market funds have private insurance coverage.

FOOTNOTES

1. The Depository Institutions Deregulation Committee (DIDC) created the Super-NOW account. This account, which became available on January 5, 1983, was a ceiling-free checking account without limitations on transactions intended to be competitive with the money funds.

2. See Rosen and Katz (1983), Fortune (1975), King (1984), and Garcia and McMahon (1984) for examples of studies of aggregate deposits.

3. The regression model controls for changes in Super-NOWs, total liquid assets in the economy, a time trend, and seasonal factors. The estimation period was from January 1979 to June 1983. The results from this regression are as follows:

A $1.00 Change in MMDAs Has the Following Impact
(Standard Errors in Parentheses)

Dependent Variable	*Effect (in dollars)*
Change in Small Denomination Time Deposits	−.52*** (.15)
Change in Large Denomination Time Deposits	−.42*** (.09)
Change in Savings Deposits	−.07 (.15)
Change in Transaction Deposits	+.06 (.07)
Change in Total Deposits Except MMDA and Super-NOW Deposits	−.96*** (.07)
Change in Total Deposits	+.04 (.07)
Change in Money Market Mutual Fund Assets	−.24* (.13)

***Significant at the 1% level
**Significant at the 5% level
*Significant at the 10% level

4. See Furlong (1983).

5. See Keeley (1984) and Keeley and Zimmerman (1984) for a discussion of the effects of ceilings on deposit costs. Also see Benston (1964), Startz (1983) and Rogowski (1984).

6. It should be noted that these marginal and average (interest plus non-interest) costs relate to a given maturity deposit at a given point in time. That is, for a deposit of a given maturity at a particular point in time, the elimination of interest ceilings reduces its marginal and average costs. This concept differs from that of differences in marginal and average costs for long-term deposits at different points in time due to the possibility of attracting new long term deposits at different rates than are being paid on existing long-term deposits that had been acquired earlier.

7. This analysis along with the smaller market for unlimited transaction accounts may explain why Super-NOWs were much less popular than MMDAs. Since Super-NOWs were close substitutes for existing checking and NOW accounts in terms of the services they provided and in terms of reserve requirements, one would expect Super-NOWs to grow rapidly only if the interest ceilings on checking and NOW accounts were binding. However, even with interest ceilings, most banks imposed fees, at least for small depositors, on such accounts. Thus, for such small depositors, the ceilings were not binding. Only for large depositors, for which the ceilings likely were binding, would there be any gain for the banks and depositors in shifting to Super-NOW accounts.

8. The concept of a quasi-fixed factor of production is due to Oi (1962).

9. The logistic function is asymptotic to O and K and symmetric around the inflection point. Its first derivative with respect to time is given by:

$$\frac{dP}{dt}_{t=t^*} = b\,\frac{K\,[K-P(t^*)]}{P(t^*)}$$

That is, the rate of growth of the logistic is inversely proportional to the growth already achieved and directly proportional to the distance from the ceiling.

In other words, $\frac{d \log [P/(K-P)]}{dt} = b$.

10. Griliches (1967) has shown that if the costs of adjustment are a quadratic function of the amount of adjustment, and if the costs of being out of equilibrium are also a quadratic function of the amount one is out of equilibrium, only a fraction of the difference between the desired and actual stock will be eliminated each period.

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