DEMAND DEPOSITS:

A COMPARISON OF THE BEHAVIOR OF

HOUSEHOLD AND BUSINESS BALANCES

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Demand deposits held by households and non-financial businesses account for nearly 70 percent of all demand balances and about one-quarter of the commercial banking system's total deposits. Since they represent an important source of bank funds, an understanding of the behavior of these two categories of demand deposits is of great operational significance to liabilities managers. Short-run variation in these balances must be accommodated by adjusting the secondary reserve position of a bank or by engaging in offsetting transactions in the market for purchased funds. Moreover, applying knowledge about the underlying trends in demand deposits of different ownership classes can aid in forecasting future balance sheet changes.

Privately held demand deposits also represent a large part of the money supply. If there are significant differences in the behavior of balances owned by households and businesses, then understanding these differences could help in interpreting money supply changes. Financial analysts interested in explaining money stock movements, therefore, also have reason to compare the behavior of household and business demand balances.

The purpose of this article is to describe and explain some of the major types of variation in demand deposit balances. It will be shown that there are significant differences in both the short- and long-run behavior of demand balances owned by households and businesses, and that these differences have implications for the efficiency with which commercial bank liabilities are managed.[1]

The article is organized in four sections. The first section briefly reviews changes in the composition of the banking system's liabilities since the late 1940's. Section two describes the survey data that provide information on private demand deposits by

ownership class. Section three analyzes sources of long- and short-run variation in household and non-financial business demand balances over the period 1971-1978. Specific topics addressed in this section include the trend-cycle behavior of demand deposits, differences in deposit behavior by bank size, and the influence of seasonality. The final section summarizes the article's main conclusions.

HISTORICAL CHANGES IN BANK LIABILITIES

Table I summarizes secular changes in commercial bank liabilities starting in the late 1940's and extending through 1978. Over this period, net total deposits of all commercial banks, defined as total demand and time deposits exclusive of deposits due to other commercial banks, increased from $132.4 billion to $918.9 billion, or at a compounded annual rate of 7.16 percent. This growth rate, while substantial, nonetheless failed to match the compounded annual increase in total assets of 7.64 percent. Consequently, total deposits as a percent of total assets fell from nearly 86 percent in 1950 to about 76 percent in 1978, as is shown in column 2 of Table I. This erosion in the deposit share of total bank liabilities was made up with nondeposit sources of funds, e.g., Eurodollars, Federal funds purchases and repurchase agreements, and the like. These nondeposit sources of funds do not generally come under the Regulation Q limitations placed on interest payments.

While total deposits were declining in importance on the banking system's balance sheet, the composition of deposit liabilities was also undergoing dramatic change. This trend is reflected in columns 3 and 4 of Table I, which show, respectively, the dollar amount of IPC (individuals, partnerships, and corporations) demand deposits and such deposits as a percent of net total demand and time deposits. Private demand deposits declined from almost 61 percent of net total deposits in 1950 to just over 30

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[1] This analysis of demand deposits complements other recent work [3, 4] dealing with the behavior of various categories of bank and thrift institution time deposit liabilities.

SECULAR CHANGES IN COMMERCIAL BANK LIABILITIES

	(1) Net Total Deposits[1]	(2)	(3) IPC Demand Deposits	(4)	(5) Household Demand Deposits[3]	(6)	(7) Nonfinancial Business Demand Deposits[3]	(8)
Period	Billions of dollars[2]	Percent of total assets	Billions of dollars[2]	Percent of net total deposits	Billions of dollars	Percent of IPC demand deposits	Billions of dollars	Percent of IPC demand deposits
1947-49	—	—	—	—	—	27.5	—	57.3
1950	132.4	85.6	80.7	60.9	—	—	—	—
1952-55	—	—	—	—	—	28.6	—	55.1
1955	168.3	85.2	98.9	58.8	—	—	—	—
1957-60	—	—	—	—	—	29.6	—	53.6
1960	201.7	82.9	110.6	54.8	—	—	—	—
1961	—	—	—	—	—	29.7	—	53.4
1965	298.6	83.8	125.6	42.1	—	—	—	—
1970	413.4	77.3	165.4	40.0	49.0	29.6	85.3	51.6
1971	474.6	79.1	176.8	37.2	56.2	31.8	89.6	50.7
1972	526.4	78.8	189.6	36.0	60.5	31.9	97.6	51.5
1973	599.0	77.7	206.4	34.4	67.3	32.6	106.6	51.6
1974	668.3	75.5	216.3	32.4	71.4	33.0	112.1	51.8
1975	711.8	76.4	232.1	32.6	74.8	33.2	115.1	49.6
1976	744.6	77.2	236.6	31.8	78.8	33.3	121.2	51.2
1977	818.1	76.1	252.9	30.9	84.1	33.3	129.2	51.1
1978	918.9	75.6	279.8	30.4	92.9	33.2	137.7	49.2

[1] Total deposits net of funds due to banks.

[2] The data are for all commercial banks as of the mid-year call report.

[3] The data for the years 1947 through 1961 are estimates derived from surveys that measured deposit ownership distribution on a single day in late January of each year. Multi-year periods are averages of these data. Data for the years 1970-78 are estimates derived from the current DDOS and are daily averages of figures for June of each year. Percentages for the periods 1947-49, 1952-55, 1957-60, and 1961 are from the Federal Reserve Bulletin, (June 1971), p. 459.

Sources: Federal Reserve Bulletin; FDIC, Assets and Liabilities.

percent in 1978. This large drop in the ratio of private demand deposits to net total deposits reflects a major shift in public preferences from noninterest-earning demand balances to time balances. Growth in other types of demand deposits, primarily government deposits, did not increase over this period. While not shown here, the ratio of private demand deposits to total demand deposits net of interbank balances remained fairly constant at around 80 to 83 percent between 1950 and 1978.

The increase in IPC demand deposits in column 3 of Table I from $80.7 billion to $279.8 billion represents a compound annual rate of increase of only 4.54 percent, versus 9.39 percent for total time deposits. It should be noted that total time deposits include all time deposits, ranging from regular savings to negotiable certificates of deposit (CD's). The growth rates on these different types of time deposits have varied depending, among other things, on market interest rates relative to Regulation Q interest rate ceilings and bank innovations in the deposit area. For example, the negotiable CD became a major source of bank funds only in the early 1960's,

when an active secondary market opened for such instruments. This institutional change helps explain the acceleration in the rate of decline in the share of private demand to total deposits that occurred between the decade of the 1950's and the decade of the 1960's. The IPC demand deposit share declined by only 6.1 percentage points in the 1950's but then by 14.8 percentage points during the 1960's. Also, Regulation Q deposit rate ceilings were increased by steps beginning in the early 1970's [4], further helping explain the continued, although somewhat slower, erosion in the demand deposit share. The IPC demand deposit share declined 9.6 percentage points during the eight-year period 1970-78.

Ownership of private demand deposit balances at commercial banks is dominated by two groups, households and nonfinancial businesses. Together, they accounted for about $230 billion or 82 percent of total private demand deposit balances in 1978. The last four columns of Table I summarize the behavior of household and nonfinancial business balances from 1947-49 through 1978. A consistent data series on demand deposits by ownership class is available only

from 1970. These data are shown in columns 5 and 7 for households and nonfinancial businesses, respectively. Households account for roughly one-third of total private demand deposits, while nonfinancial businesses account for roughly one-half. The remaining proportion of total private demand deposits, something between 15 and 20 percent, is owned by various other groups, e.g., financial businesses and foreigners.

The shares of private demand deposits owned by households and nonfinancial businesses, shown in columns 6 and 8 of Table I, have not been steady over time. Household deposits have been growing relatively faster than business deposits for a number of years. In fact, the compound annual rate of growth of household demand deposits over the eight-year period 1970-78 is 8.32 percent, about a third greater than the 6.17 percent rate for nonfinancial business deposits. In the last three years of this period, however, the growth rate of household demand deposits decelerated to 7.49 percent while the nonfinancial business demand deposit growth rate remained steady. This change in relative growth rates is reflected in the stabilization of the household share of IPC demand deposits at about 33.2 to 33.3 percent starting in 1975.

THE DEMAND DEPOSIT OWNERSHIP SURVEY

Detailed information on the classification of privately owned commercial bank deposits is, with one exception, not available from the regular reports required of all banks. Schedule F of the Consolidated Report of Condition requires separate reporting of savings balances owned by "individuals and nonprofit organizations" and "corporations and other profit organizations." Separate reporting of demand and time deposits by ownership classification is not required. In the case of time deposits, however, deposits greater than $100,000 in size are listed on the face of the report in a memorandum item. This allows separation of time balances into small and large deposit categories, a division which probably reflects the distinction between individual versus corporate and governmental ownership fairly accurately. In the case of demand deposits, however, no such distinctions are possible.

Table I suggested that the behavior of private demand deposits varies significantly by ownership class. One source of information, namely the Demand Deposit Ownership Survey (DDOS), allows analysis of private demand deposits by ownership classification. This section will briefly describe the

survey and its relationship to published money stock data.[2]

The DDOS, begun in June 1970, is based on a nationwide sample of banks stratified by size. These sample data are used to develop estimates of demand deposits by ownership class. Large weekly reporting banks report daily data for each month, while the smaller banks report daily data for the last month of each quarter. Using these reports, it is possible to make daily average estimates of monthly IPC deposit ownership at large banks, and daily average estimates for the last month of each quarter of IPC deposit ownership at all banks. These estimates are published in the Federal Reserve Bulletin. It has been noted [6] that the first 6 months of data collected under the survey may be unreliable due to start-up reporting and editing problems.

DDOS reporting banks classify IPC demand deposits into five ownership categories: financial businesses, nonfinancial businesses, consumer, foreign, and all other domestic depositors. The nonfinancial business and consumer data for June of each year are listed in Table I. These two categories are the largest of the five. The nonfinancial business category includes both industrial and professional accounts. The consumer category includes individual and family accounts, as well as personal trust accounts not under the control of bank trust departments.

DDOS data differ from published money stock data in three important respects. First, M_1 includes not only demand deposits but also currency. Second, the demand deposit component of M_1 includes not only IPC deposits but several other categories as well, e.g., state and local government demand deposits and demand deposits of foreign banks. Finally, and most important, the demand deposit component of M_1 is adjusted to exclude cash items in process of collection (CIPC) and Federal Reserve float. DDOS deposit data include CIPC and float. After taking these various differences into account, it is possible to arrive at a close reconciliation of DDOS private demand deposit data and the private demand deposit component of M_1. It has been shown that total IPC demand deposits, as estimated quarterly from the DDOS, differ from an estimate of gross IPC deposits derived from M_1 by an average of only .4 percent over the period starting in the third quarter of 1970 and ending in the first quarter of 1976 [6].

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[2] This summary is based on two articles prepared by the staff of the Federal Reserve Board [6, 11].

ANALYSIS OF VARIATION IN PRIVATE DEMAND DEPOSITS

Very little analytical use has been made of the DDOS, probably because of the relatively short history of the data series. Now, however, several years of data covering the 1970's are available for analysis. This section of the article examines and compares the behavior of household and nonfinancial business demand deposits using DDOS data.

Explaining Changes in Demand Deposits The composition of the banking system's balance sheet largely reflects the preferences of individuals and businesses for incurring certain types of financial liabilities (bank loans) and holding certain types of financial assets (bank deposits). One type of financial asset held with the banking system, namely demand deposits, accounts for about three-quarters of M_1, which is the narrowly defined money stock. It is useful, therefore, to relate changes in private demand deposits to some of the key factors that are considered important in explaining the demand for money. These factors include real income, the average price level, the opportunity cost of holding money (demand deposits), and institutional arrangements in the financial system. While the significance of the various economic factors is clear, institutional arrangements require a bit more description.

Institutional arrangements influencing the public's holdings of demand deposits include the regulations under which suppliers of demand deposits operate and the availability of money substitutes. The most significant regulation is Regulation Q, which governs the amount of interest that can be paid on various categories of bank deposits. Under Regulation Q, interest payments on demand deposit balances are expressly prohibited. This feature of the institutional background to money demand has been unchanged since 1933. Other aspects of the institutional environment, however, are changing rapidly. In particular, recent years have witnessed the introduction of a number of financial innovations that are either close substitutes for demand deposits or that allow the public to economize on demand deposit balances. Examples pertaining to households include NOW accounts, which are direct substitutes for demand deposits, and automatic transfer services, which permit the convenient and low cost transfer of funds into and out of demand accounts.[3] In the case of

[3] See [1] for a discussion of the background to and implications of automatic transfer services. The U. S. Circuit Court for the District of Columbia ruled on April 20, 1979 that automatic transfer services are not authorized under current law, but gave until January 1, 1980 for banks to comply with the order.

Table II

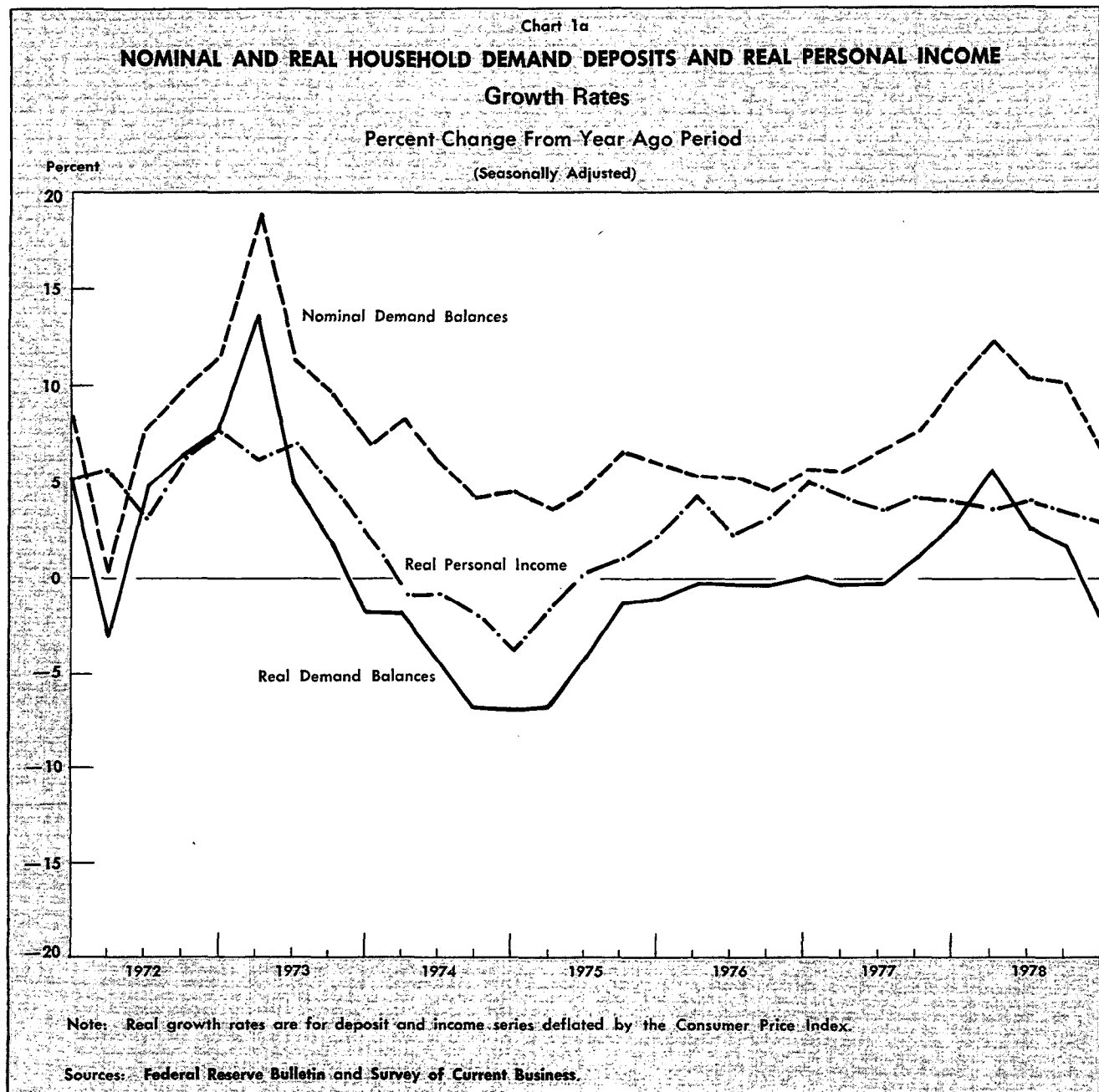## ANNUAL RATE OF CHANGE IN DEMAND DEPOSIT BALANCES MINUS ANNUAL RATE OF CHANGE IN NOMINAL GNP[1]

Period	Households	Nonfinancial Businesses
1971 IV	0.03	− 3.07
1972 I	− 7.79	− 0.99
II	− 1.40	− 0.14
III	0.00	0.99
IV	0.31	0.62
1973 I	6.61	− 1.33
II	− 0.63	− 2.72
III	− 2.23	− 5.36
IV	− 4.56	− 5.63
1974 I	− 0.43	− 3.45
II	− 2.10	− 3.11
III	− 3.71	− 3.04
IV	− 1.83	− 4.09
1975 I	− 0.69	− 1.66
II	0.59	− 1.59
III	− 3.91	− 6.24
IV	− 5.76	− 6.24
1976 I	−10.92	−11.38
II	−11.55	−11.68
III	− 4.94	− 6.39
IV	− 3.78	− 5.40
1977 I	− 3.99	− 2.67
II	− 4.05	− 4.25
III	− 3.83	− 6.84
IV	− 1.87	− 2.14
1978 I	2.30	− 5.14
II	− 1.37	− 5.29
III	− 1.17	− 0.46
IV	− 5.91	− 6.05

[1] Percentage change from the same quarter one year ago.

businesses, cash management and short-term investment services are often used to reduce average demand balances.[4] The net effect of such financial innovations is to reduce the public's need for demand deposit balances.

The combined effects of these economic and institutional factors on demand deposits can be calculated approximately using the concept of deposit velocity. There are two variations of the concept of velocity, namely income velocity and transactions velocity. Income velocity is calculated by dividing the stock of demand deposits into nominal income, while transactions velocity is proxied by dividing average de-
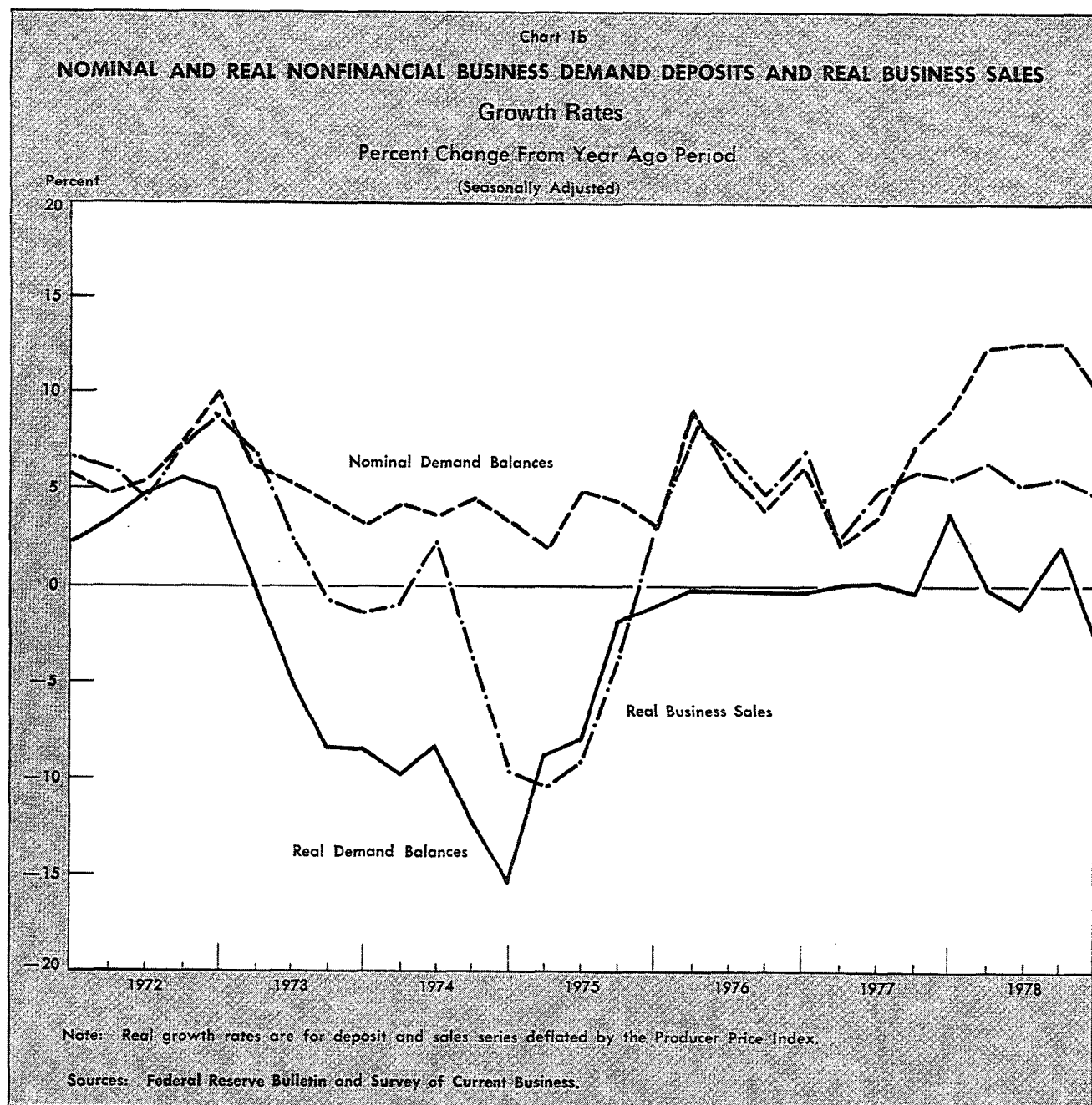
[4] See [5] for a comprehensive discussion of the cash management techniques currently available to businesses. It is clear from reading Garvy and Blyn [7] that corporate cash management opportunities have been developing for many years.

Chart 1a

NOMINAL AND REAL HOUSEHOLD DEMAND DEPOSITS AND REAL PERSONAL INCOME

Growth Rates

Percent Change From Year Ago Period

(Seasonally Adjusted)

Note: Real growth rates are for deposit and income series deflated by the Consumer Price Index.

Sources: Federal Reserve Bulletin and Survey of Current Business.

mand deposit balances into total debits against demand deposit accounts for a specified period. Both variations measure essentially the same thing, i.e., the efficiency with which demand deposits are used. An increase in velocity, for instance, signifies that nominal income and/or transactions are increasing faster than nominal demand deposit balances. The income and transactions velocity of demand deposits are highly correlated and have been increasing steadily in the period since World War II [7]. This upward trend in velocity likely reflects the increased oppor-

tunity costs of holding money as well as the increased availability of close substitutes for demand deposits. Later in this article, the concept of velocity will be used to interpret the significance of differences between household and business demand deposit and income growth rates.

Trends and Cycles in Demand Deposits The data reviewed in Table I indicated that private demand deposits have grown constantly over the past three decades, but that this growth has fallen short of

Chart 1b

NOMINAL AND REAL NONFINANCIAL BUSINESS DEMAND DEPOSITS AND REAL BUSINESS SALES

Growth Rates

Percent Change From Year Ago Period

(Seasonally Adjusted)

Nominal Demand Balances

Real Business Sales

Real Demand Balances

Note: Real growth rates are for deposit and sales series deflated by the Producer Price Index.

Sources: Federal Reserve Bulletin and Survey of Current Business.

the growth in time deposits. Moreover, the data indicated that trend growth has differed for household and nonfinancial business demand deposit balances.

As mentioned earlier, real income and the average price level are two key economic factors explaining the public's desired holdings of demand deposits. These factors are separate components of nominal, or current dollar income. The real component of nominal income explains real changes in purchasing power, while the price component explains changes
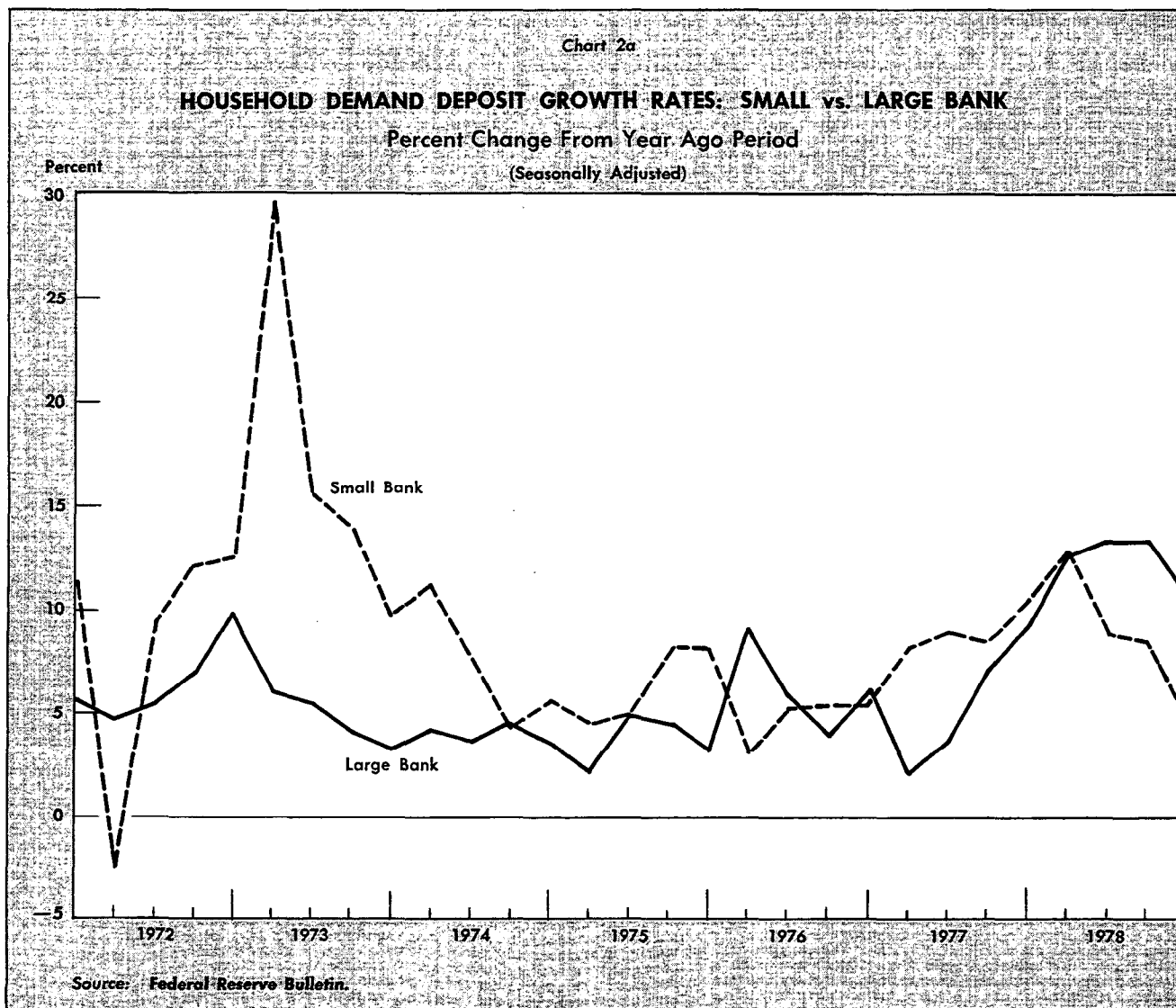
due simply to inflation. The information in Table II is intended to help show the influence of nominal income changes on demand deposits. Table II lists the difference between the annual rates of change, measured as the percent change from the same quarterly level one year ago, between (1) household demand deposits and nominal GNP and (2) nonfinancial business demand deposits and nominal GNP. The period covered is 1971 IV through 1978 IV and the deposit and nominal GNP data used to compute the growth rates are seasonally adjusted. The growth

rates for nominal GNP and both household and non-financial business demand deposits are all positive over this period.

If demand deposit balances were growing at roughly the same rate as nominal income, then the values of the differences in deposit and nominal GNP growth rates listed in Table II would all fall around zero. Clearly, this is not the case. With only several exceptions, most of which are clustered in the early 1970's, the differences are negative. This shows that both household and nonfinancial business demand deposit balances have been growing at rates below those for nominal GNP. The average shortfall from nominal GNP growth is 2.71 percentage points for household balances and 3.96 percentage points for nonfinancial business balances. The implication of this information for liabilities managers is that pro-

spective changes in nominal income can provide a guide to the outlook for demand deposits. Moreover, the larger shortfall for business balances suggests that the factors explaining demand deposit growth have influenced the business sector differently than the household sector. In view of these differences, it would be interesting to examine the behavior of these two major sectors more closely.

Charts 1a and 1b each plot two series of quarterly demand deposit growth rates for households and nonfinancial businesses, respectively. These series are for nominal deposits and real deposits, or nominal balances deflated by a price index. In addition, Chart 1a shows a plot of the annual growth rate in real personal income while Chart 1b shows a plot of the growth rate in real business sales. The real income and sales series are assumed to be good

Chart 2a

HOUSEHOLD DEMAND DEPOSIT GROWTH RATES: SMALL vs. LARGE BANK

Percent Change From Year Ago Period

(Seasonally Adjusted)

Source: Federal Reserve Bulletin.

proxies for the volume of transactions entered into by the household and nonfinancial business sectors, respectively. The price deflator used for households is the Consumer Price Index, and that used for businesses is the Producer Price Index. These charts are useful for separating the effects of price level changes from real factors on public decisions about the quantity of demand balances held.

Assuming that demand deposits are held to finance transactions, the demand for such balances can be related to the volume of transactions and the average price per transaction. Other things being equal, a rise in the average price level would require a proportionate rise in checking balances if a steady volume of real transactions is to be maintained. Likewise, an increase in the volume of real transactions would also require a proportionate rise in checking balances held, all other things being equal. Compare first the nominal demand deposit growth rates with the real demand deposit growth rates for households on Chart 1a and the nominal demand deposit growth rates with the real demand deposit growth rates for nonfinancial businesses on Chart 1b. The real deposit growth rates are almost always lower than the nominal growth rates for both households and busi-

nesses. These comparisons show that inflation is an important factor explaining growth in the public's transactions balances. To what extent, however, do changes in real income and transactions explain changes in price deflated demand deposit balances?

Compare now the real demand deposit growth rates with the real income growth rates for households on Chart 1a and the real demand deposit growth rates with the real sales growth rates for nonfinancial businesses on Chart 1b. With only one exception in the period starting 1973 II, the growth rates for real personal income in Chart 1a exceed the growth rates for household real demand balances (the exception is 1978 I). With only three exceptions in the period starting 1972 III, the growth rates for real business sales in Chart 1b exceed the growth rates for nonfinancial business real demand balances (the exceptions are 1975 I-III). Thus, it appears that, since at least mid-1973 in the case of households and the end of 1972 in the case of nonfinancial businesses, growth in real demand deposit balances has been less than growth in the volume of real transactions. The amount by which real demand deposit growth has fallen short of growth in real transactions, moreover, has been substantial. Since
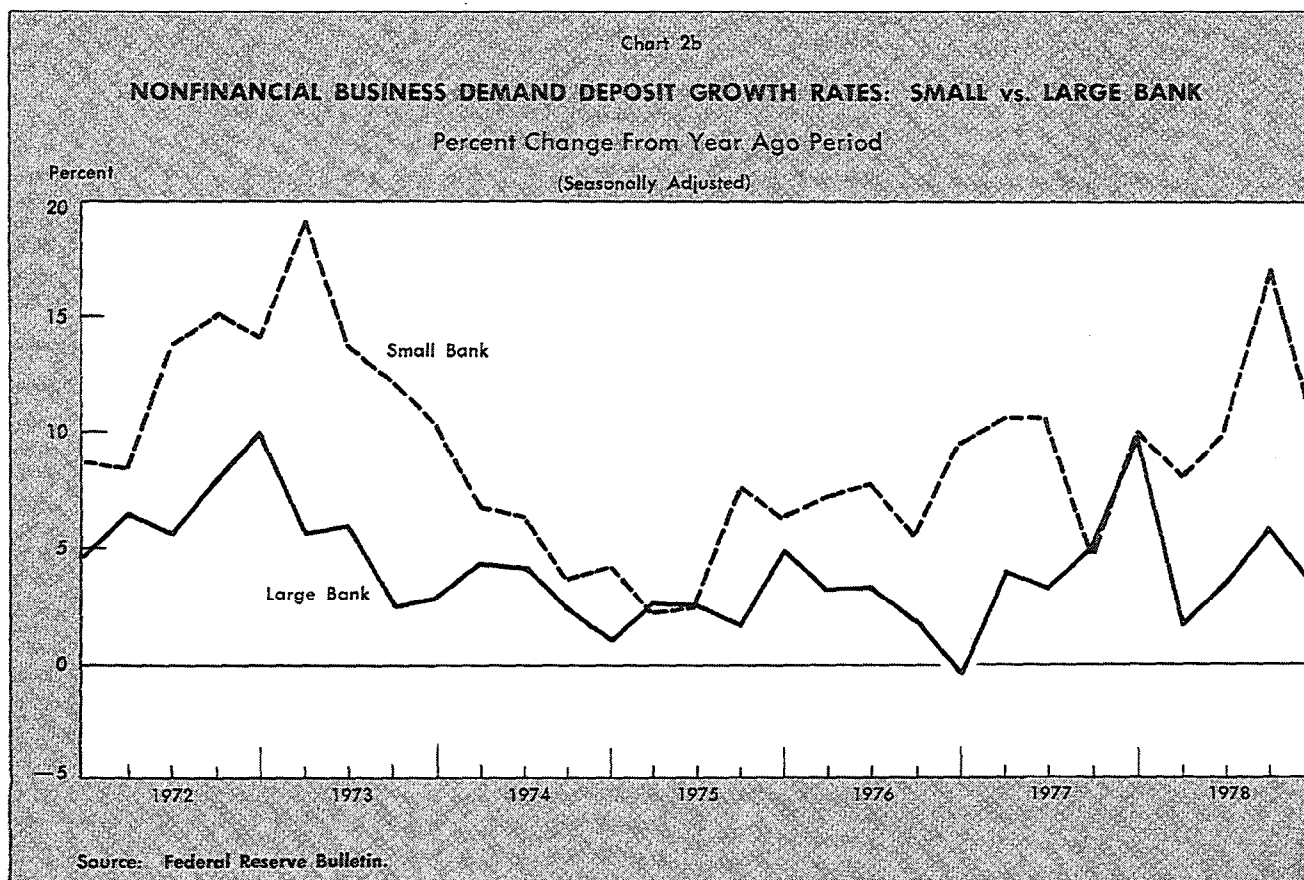

Chart 2b

NONFINANCIAL BUSINESS DEMAND DEPOSIT GROWTH RATES: SMALL vs. LARGE BANK

Percent Change From Year Ago Period

(Seasonally Adjusted)

Source: Federal Reserve Bulletin.

Table III

DEMAND DEPOSIT STABILITY AT SMALL AND LARGE BANKS

DEMAND DEPOSITS OF HOUSEHOLDS

	$\bar{R}^2$	SER/Mean of dependent variable
Small bank	.962	.0102
Large bank	.967	.0070

DEMAND DEPOSITS OF NONFINANCIAL BUSINESSES

	$\bar{R}^2$	SER/Mean of dependent variable
Small bank	.975	.0081
Large bank	.966	.0042

These results are for quarterly time series regressions covering the period 1970 IV through 1978 IV using seasonally adjusted DDOS data. The regressions are of the form

$$\ln Y = a + b X,$$

where Y = seasonally adjusted demand deposits and X = time.

1973 II, household real demand deposit growth has on average been about 3 percentage points below real income growth, while since 1972 III nonfinancial business real demand deposit growth has been on average about 5 percentage points below real sales growth.

These findings imply that demand deposit velocity has risen since the early 1970's, or stated another way that money balances have been used more efficiently. More efficient use of demand deposits is consistent with the view that money demand is partly a function of the opportunity costs of holding balances that earn no interest. In addition, increasing demand deposit velocity lends support to the idea that the public has benefited from the availability of new cash management technology.

Differences by Size of Bank DDOS data indicate that at the end of 1978 large banks held $37.8 billion in household demand deposits, or about 40 percent of the household sector's total holdings. They also held $75.3 billion in nonfinancial business demand deposits, or about 52 percent of the nonfinancial business sector's total holdings. Large banks thus account for almost half of the combined demand balances of households and businesses. This section will examine whether or not demand deposit growth differs by bank size class.

Charts 2a and 2b show annual rates of change for household and nonfinancial business nominal demand deposit balances on a quarterly basis by size of bank. The pattern of growth rates for large banks appears to differ from that of small banks, for both household

and nonfinancial business deposits, in two respects: (1) the large bank growth rates are generally lower than the small bank growth rates and (2) there appears to be generally less variation in the growth rate fluctuations for large banks. The average annualized quarterly growth rate for household demand balances is 8.8 percent at small banks versus 6.1 percent at large banks; for nonfinancial business demand balances the average rate is 9.2 percent at small banks and 4.2 percent at large banks. In both deposit categories, therefore, demand balances have grown substantially more at small than at large banks since late 1971. The difference in growth rates is especially noticeable in nonfinancial business deposits, however, the large bank average growth rate being less than half the small bank growth rate.

The patterns of the growth rates on Charts 2a and 2b suggest that there may be a convergence occurring in the large and small bank series in recent years. Since about mid-1974, the large and small bank series for household sector deposits have moved more closely together than in the prior period. This convergence is also visible on Chart 2b for nonfinancial business deposits, although it does not appear as strong as in the case of household deposits.

These results support the conclusion that demand deposit growth has been stronger at smaller, compared to larger, banks during the 1970's. There are several possible explanations for the stronger growth at smaller banks, including higher income growth for the customers of smaller institutions, lower costs of demand deposit services at smaller banks, and greater availability of cash management services at the larger banks. Whatever the reasons, however, it appears that managers of smaller banks are beginning to face the lower demand deposit growth rates already experienced by larger institutions.

Longer-run Demand Deposit Stability Inspection of Charts 2a and 2b makes it clear that there is considerable cyclical variation in demand deposit growth. As mentioned above, the pattern of cyclical variation does not appear to be the same for the small compared to large bank groups. The significance of cyclical instability for household and business demand deposits will be examined here for both small and large commercial banks.

One way to focus on the longer-run cyclical variation in demand deposits is to examine the deviations of seasonally adjusted demand deposits from their underlying trend. To accomplish this, the series being examined must first be seasonally adjusted to eliminate recurring short-run influences that are possible sources of variation. Then a long-run trend

can be computed by relating the movements in the seasonally adjusted series to time. The trend is obtained from a regression equation with the relevant deposit series as the dependent variable and time as the sole explanatory variable. The residuals resulting from such a regression represent the cyclical movements in the series. Measures of such variation are presented in Table III for quarterly household and nonfinancial business demand deposit series of both small and large banks covering the eight-year period 1970 IV to 1978 IV.

The first column in Table III gives the coefficient of determination, adjusted for degrees of freedom, for regression equations that have the log of quarterly seasonally adjusted demand deposits as the dependent variable and time as the sole independent, or explanatory variable. These coefficients are all quite high, indicating in each case that over 96 percent of the variation in the series is trend-related. This result is not unexpected, since trend is the primary component of many financial time series measured in stock form. Nevertheless, the small percentage of the variation in demand deposits not explained by trend, or roughly 4 percent, represents a significant amount of dollar variation, especially when viewed over shorter time periods.
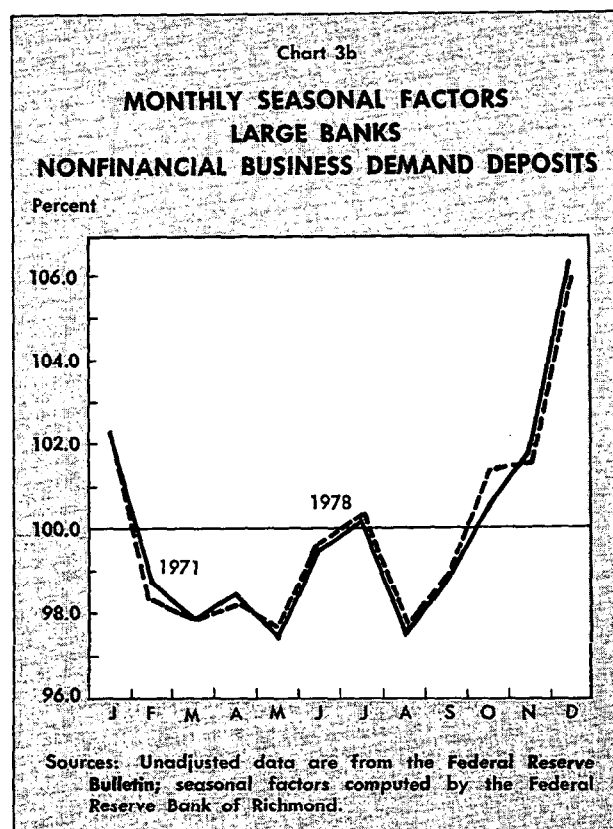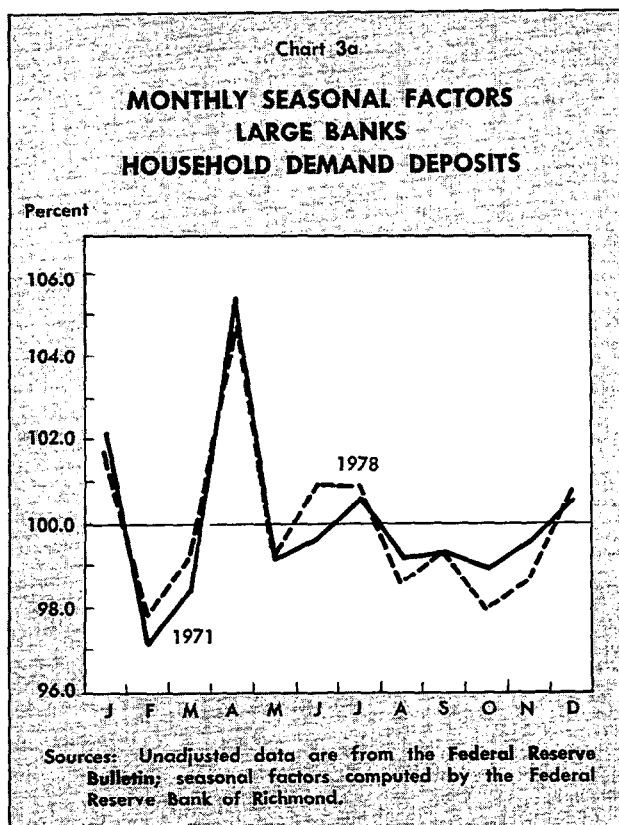
The degree of cyclical variation in the deposit series can be measured using the regression statistic called the standard error of the regression (SER). Like a standard deviation, the SER provides a confidence interval measured in the same units as the series being analyzed. One SER, for example, represents the zone around the regression line (in this case, the trend line) within which roughly two-thirds of all deviations are expected to fall. Although the four series considered in Table III are all measured in dollars, their SER's cannot be used to directly compare the relative degree of variation of household and nonfinancial business demand deposits at small and large banks. This is the case inasmuch as each series is of different absolute size: in 1978 IV seasonally adjusted household demand deposits at small banks totaled $58.1 billion versus $37.8 billion at large banks, while seasonally adjusted nonfinancial business demand deposits totaled $70.9 billion versus $75.3 billion at large banks. Other things equal, the dollar deviation around a higher demand deposit series is expected to be greater than the dollar deviation around a lower demand deposit series. Size differences must be taken into account when evaluating the relative degree of stability among the four demand deposit series in Table III.

To adjust for differences in the levels of the four demand deposits series, the SER for each is divided by its mean value. The resulting numbers, which may be called standardized SER's, are presented in the second column of Table III. These numbers express the SER as a percentage of the mean value of each series. The standardized SER's in Table III can be directly compared to gain an idea of the relative degree of variation in demand deposits of households and businesses held in small and large banks.

The figures in Table III show that the cyclical stability of household demand deposits is considerably less than the cyclical stability of nonfinancial business demand deposits. For small banks, the SER is greater than 1 percent of the mean of the household demand deposits series versus 0.81 percent for nonfinancial business demand deposits: this indicates about 25 percent more variation in household balances than in business balances at small banks. Likewise, the SER is equal to 0.70 percent of the mean of the household demand deposit series for large banks versus 0.42 percent for nonfinancial business balances; this indicates about 66 percent more variation in household balances than in business balances at large banks. At both small and large banks, therefore, nonfinancial business demand deposits offer considerably more cyclical stability than do household demand deposits.

Further examination of the standardized SER's in Table III provides another interesting comparison, namely that between demand deposit stability at small versus large banks. Recall the discussion of differences in demand deposit growth by size of bank centering around Charts 2a and 2b. It was shown that the average annualized quarterly growth rates for both household and nonfinancial business demand balances were significantly greater at small compared to large banks. Moreover, the pattern of growth rates plotted on Charts 2a and 2b make it appear that there is less variation in growth rate fluctuations for large banks. This latter point is confirmed in Table III. The cyclical variation in household demand deposits is about 45 percent less at large compared to small banks (0.70 percent versus 1.02 percent) and over 90 percent less in the case of nonfinancial business demand deposits (0.42 percent versus 0.81 percent).

Short-run Demand Deposit Stability While cyclical forces are a significant source of longer-run variation in demand deposits, seasonal forces are responsible for considerable short-run variation. The influence of seasonality on the short-run stability of

Chart 3a

MONTHLY SEASONAL FACTORS
LARGE BANKS
HOUSEHOLD DEMAND DEPOSITS

Percent

1978

1971

Sources: Unadjusted data are from the Federal Reserve
Bulletin; seasonal factors computed by the Federal
Reserve Bank of Richmond.

Chart 3b

MONTHLY SEASONAL FACTORS
LARGE BANKS
NONFINANCIAL BUSINESS DEMAND DEPOSITS

Percent

1978

1971

Sources: Unadjusted data are from the Federal Reserve
Bulletin; seasonal factors computed by the Federal
Reserve Bank of Richmond.

household and nonfinancial business demand deposits held at large banks will be examined here.[5]

The money holdings of the public are subject to significant changes on a seasonal basis. Although both demand deposit and currency holdings are subject to such short-run variation, seasonality is concentrated in the deposit part of total money holdings. Based on examination of the demand deposit component of M_1, it would appear that April, December, and January, but especially the latter two months, are periods of peak seasonal demand for checking deposit balances, with offsetting seasonal weakness distributed over the rest of the year [9]. Seasonal variations in the demand for checking balances, however, are not identical for households and businesses.

Charts 3a and 3b depict, respectively, the monthly seasonal factors for household and nonfinancial business demand deposits of large banks. Two sets of factors, one for 1971 and another for 1978, are plotted in each of the charts. Looking first at Chart 3a for household balances, it can be seen that January and especially April are months of substantial positive seasonality, i.e., household demand deposits are un-

usually large at these times. The January peak is over 2 percentage points above and the April peak over 5 percentage points above the yearly average level of demand deposits. These seasonal peaks are explained by what has been termed the "Christmas cycle," which reflects the rising demand for transactions balances associated with increased spending during the holiday season, and by tax payments of individuals in April [2]. June, July, and December are months of moderate positive seasonality. February has a substantially negative seasonal factor, while the months of March, May, and August through November have moderately negative factors.

Chart 3b shows that the seasonal demand for deposit balances by businesses centers around the Christmas season. Seasonal demands are depressed or roughly neutral throughout most of the year, with a seasonal surge beginning in October and peaking in December. The December peak for large banks is nearly 6 percentage points above the yearly average level of demand. This declines to about 2 percentage points above average in January before subsequently falling below average in February.[6]

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[5] Monthly seasonal factors cannot be computed for all commercial banks since only quarterly data are available for this group.

[6] Note that the Christmas seasonal peak in demand deposits occurs in January for households but December for businesses. The increased business activity associated

Comparison of the 1971 and 1978 factors reflects a remarkable degree of stability in the seasonal patterns of both household and business demand deposits over the seven-year period. The only case of a shift in the direction of the seasonal is in June for households, where the change is from slightly negative to moderately positive seasonality. This stability in seasonal patterns over time means that short-run changes in demand deposits due to seasonal influences are largely predictable, thus considerably easing the task of adjusting to such variations in demand deposits.

A comparison of the large bank 1978 monthly factors in Charts 3a and 3b suggests that the seasonal patterns exhibited by household and nonfinancial business demand deposit balances are somewhat offsetting. For instance, the year-end factors lying above 100.0 for businesses are offset by lower values for households, and the converse appears true in the second quarter. This implies that the mix of an individual bank's private demand deposits between households and nonfinancial businesses can also influence short-run balance sheet stability.[7] The significance of the demand deposit mix for short-run balance sheet stability can be evaluated by comparing the standard deviation for several different balance sheet combinations of household and business demand deposits.

Assume for a moment that a bank has all household demand deposits. In this extreme case, the standard deviation of the monthly seasonal factors in Chart 3a around the neutral value would be 2.08 percent. At the opposite extreme where a bank has all business demand deposits, the standard deviation of the monthly seasonal factors in Chart 3b for nonfinancial business deposits would be 2.45 percent. Now assume that a bank has an equal mix of demand deposits, half household and half nonfinancial business. The seasonal factors for each category of deposits have equal weight on the balance sheet, and they can be averaged across months to get monthly average factors for the equally weighted mix of de-

posits. In this case, the standard deviation of the weighted average seasonal factors equals 1.72 percent, a significant reduction from the two extreme cases discussed above. Thus, the mix of demand deposits is important in determining the *total* seasonal variation in demand deposits that a bank will face.[8]

The demand deposit mix which minimizes total seasonal variation can be determined using the formula for calculating the variance of a linear combination of random variables [8, p. 168]. Applying this method to monthly seasonal factors for 1978 shows that a combination of 59 percent household balances and 41 percent business balances would minimize total seasonal variation in demand deposits. Using all the monthly seasonal factors for the years 1971 through 1978 gives results that are very close to those based only on 1978 data, namely, a combination of 62 percent household balances and 38 percent business balances.[9] The closeness of the results reflects the relatively unchanging pattern of seasonality over the period. The actual not seasonally adjusted large bank demand deposit mix as of December 1978 was 32.6 percent household and 67.4 percent business.

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[8] As noted earlier, the mix between household and business demand deposits has changed significantly over the past three decades, with the household share growing steadily. Since the seasonal behavior of household and business balances varies greatly, the changing composition of total private demand deposits is probably an important factor helping explain shifts in the seasonal pattern of M1 described in [9].

[9] The variance in total demand deposits due to seasonal influences, σ_D^2, is given by the formula:

(1) $\quad \sigma_D^2 = k_H^2 \, \sigma_H^2 + k_B^2 \, \sigma_B^2 + 2k_H \, k_B \, \rho_{HB} \, \sigma_H \, \sigma_B$,

where ρ_{HB} is the correlation coefficient of the monthly seasonal factors for household and business demand deposits. k_H and k_B are weights showing the respective proportions of household and business demand deposits to total demand deposits. Since there is a constraint that $k_H + k_B = 1$, (1) can be expressed as

(2) $\quad \sigma_D^2 = k_H^2 \, \sigma_H^2 + (1-k_H)^2 \, \sigma_B^2 +$

$\qquad 2 \, k_H \, (1-k_H) \, \rho_{HB} \, \sigma_H \, \sigma_B$.

Setting the first derivative $\dfrac{d \, \sigma_D^2}{d \, k_H}$ equal to zero and solving for k_H gives

(3) $\quad k_H = \dfrac{\sigma_B^2 - \rho_{HB} \, \sigma_H \, \sigma_B}{\sigma_H^2 + \sigma_B^2 - 2\rho_{HB} \, \sigma_H \, \sigma_B}$.

The second order condition for a minimum holds if the second derivative $\dfrac{d^2 \, \sigma_D^2}{d \, k_H^2}$ is positive, where

(4) $\quad \dfrac{d^2 \, \sigma_D^2}{d \, k_H^2} = 2\sigma_H^2 + 2\sigma_B^2 - 4 \, \rho_{HB} \, \sigma_H \, \sigma_B$.

Following this procedure using monthly seasonal factors for 1978 gives $\rho_{HB} = .12$, $k_H = .59$, and a positive value for equation (4). Using all the monthly seasonal factors for the years 1971 through 1978 gives $\rho_{HB} = .15$, $k_H = .62$, and a positive value for equation (4).

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with the holiday starts several months before December, as firms place orders and accumulate inventories, giving rise to greater demand for payments balances. Firms rapidly reduce their demand deposit balances once the holiday activity tapers off. Households apparently pay for a large share of Christmas purchases on a delayed basis, causing their demand deposit balances to peak in January.

[7] A special 1968 survey of demand deposit ownership conducted by the FDIC showed that there is great diversity in the deposit mix by state [10]. The proportion of IPC demand deposits held by businesses ranged from a high of 73 percent in New York to a low of 33 percent in Idaho and North Dakota. The all bank average was 59 percent.

CONCLUSIONS

Although steadily declining in importance on the commercial banking system's balance sheet since at least 1950, demand deposits nonetheless remain an important source of funds. In fact, privately owned demand deposits in 1978 equaled over 30 percent of total deposits net of interbank balances. The two most important suppliers of demand deposits to commercial banks are households and nonfinancial businesses. Households owned 33.2 percent of total private demand balances, or about $93 billion in 1978, while nonfinancial businesses owned 49.2 percent, or about $138 billion. This article examines the time series behavior of these two ownership categories using the Federal Reserve's Demand Deposit Ownership Survey.

Inflation is an important factor causing the public to hold increasingly larger transactions, or demand deposit balances. When nominal demand deposits are deflated by the price level to get real balances, however, it is found that the growth rates of real demand deposit balances of both households and nonfinancial businesses have been less than the growth rates of real income since at least the early 1970's. Since the second quarter of 1973, growth in household real demand deposits has on average been about 3 percentage points below growth in real income. Since the third quarter of 1972, growth in nonfinancial business real demand deposits has on average been about 5 percentage points below growth in real sales. Thus, both households and businesses have economized on their holdings of cash balances to a significant extent, although businesses have done so more than have households.

The longer-run trend and cyclical behavior of demand deposits is not constant by size of bank. Demand deposit growth has been considerably greater at smaller compared to larger banks for both household and nonfinancial business balances. The cyclical stability of demand balances, however, is considerably greater at larger compared to smaller banks.

Seasonal influences lead to significant short-run variation in demand deposit balances. Comparison of seasonal factors for the years 1971 and 1978, however, shows that changes over this period have been minor. Consequently, the seasonal influences affecting short-run variation in both household and nonfinancial business demand deposits are to a large degree predictable. The seasonal patterns exhibited by the demand deposit balances of households and nonfinancial businesses are partially offsetting. Therefore, the mix of demand balances by ownership

classification influences the overall degree of seasonal variation in a commercial bank's demand deposits.

These findings should help bank liabilities managers and financial analysts better understand the patterns of short- and long-run variation in private demand deposits. Perhaps the most interesting general conclusion that can be drawn from the analysis is that there are striking contrasts between the behavior of household and business demand balances. This points out the importance of treating demand deposits held by households and businesses as two separate sources of funds for liabilities management purposes. Moreover, the information gained by following a disaggregated approach to explaining changes in demand deposits should lead to a better understanding of money stock movements.

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MONEY MARKET MUTUAL FUNDS:

## A Reaction To Government Regulations Or A Lasting Financial Innovation?

Timothy Q. Cook and Jeremy G. Duffield

One of the most remarkable changes in the nation's financial system in recent years has been the rapid growth of money market mutual funds (MMFs). These funds are open-end investment companies that invest only in short-term money market instruments. Although the first MMF started offering shares to the public in 1972, prior to 1974 there were only a couple of MMFs. The establishment of many new MMFs followed the very high money market rates in 1974 and by the end of 1975 there were roughly 35 MMFs in existence with assets totaling just under $4 billion. The level of MMF assets remained in a range of $3 to $4 billion until late 1977. At that time, interest rates began to rise and aggregate MMF assets increased sharply. When short-term rates continued to rise in 1978, MMF growth accelerated and in the first five months of 1979 outstanding shares grew by more than $2 billion a month. As shown in Chart 1, the rapid growth in MMF shares was accompanied by equally rapid growth in shareholder accounts, to a level of about 1 million in May 1979.[1]

The general operating characteristics of MMFs are fairly standard, although there are some differences. Investors purchase and redeem MMF shares without paying a sales charge. Expenses of the funds are deducted daily from gross income. Minimum initial investments for most funds vary from $500 to $5,000, although a very small number of funds require no minimum and others, designed for institutional investors only, require minimums of $50,000 or more. The yield paid to the shareholder of a MMF depends primarily on the yields of the securities held by the fund but is also dependent on the expenses of the fund and its accounting policies. Most funds have a checking option that enables shareholders to write checks of $500 or more. Shares can also be redeemed at most MMFs by telephone or wire request,

in which case payment by the MMF is either mailed to the investor or remitted by wire to the investor's bank account.

The purpose of this article is to examine the reasons underlying the explosive growth of MMFs. There are two explanations for this growth, both stressing a different broad function served by MMFs. The first explanation is that MMFs are primarily a means for providing *access* to money market yields. According to this view, government regulations and minimum purchase requirements in the money market have significantly limited the ability of some investors to realize market yields on short-term investments. MMFs provide such investors an op-

Chart 1

THE GROWTH OF MONEY MARKET FUNDS

Source: Investment Company Institute.

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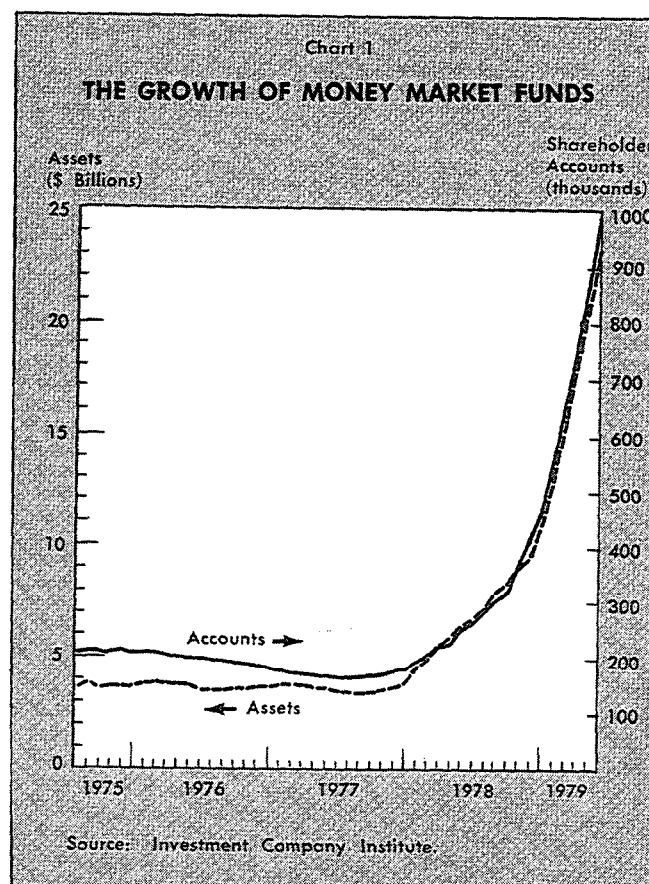
[1] The shareholder accounts data are somewhat difficult to interpret because MMFs differ in how they report accounts of bank trust departments and other institutional investors. In some cases a bank trust department is treated as one account. In other cases each of the accounts of the bank trust department are treated as separate accounts.

portunity to bypass these obstacles and earn a rate of return close to the yield of money market instruments. To the extent that this explanation is valid, one can argue that changes in certain government regulations would largely eliminate the appeal of MMFs.

The second explanation for the growth of MMFs is that they fill a vacuum in the financial system, which previously lacked an intermediary specializing exclusively in short-term assets and liabilities. According to this view, the growth in MMFs represents a permanent change in the way many institutional and individual investors manage their liquid assets. This change has occurred because MMFs offer these investors the advantages that result from the pooling of large amounts of short-term funds.[2] Briefly, the possible advantages are:

Economies of Scale By pooling the funds of many investors, the MMF may experience lower administrative and operating costs per dollar of assets than the investors themselves could achieve. Consequently, a MMF may be able to offer some investors a higher rate of return *net* of expenses than is available to them through direct investment in money market instruments.

Liquidity and Divisibility Money fund shares can be purchased and sold on any business day without a sales charge. Also, because of the short-term nature of the money market instruments purchased by MMFs, the investor faces a relatively small probability of loss of principal due to interest rate fluctations. Consequently, a purchase of money fund shares represents a highly liquid investment. The checking option offered by most MMFs further enhances the liquidity of this investment. MMFs are able to offer such liquidity because of the relatively large size of their portfolios, which allows them to schedule maturities so that they usually can meet redemption requests without selling securities prior to maturity. In addition, after satisfying the initial minimum investment requirement, additions to and withdrawals from MMFs can generally be made in very small amounts. By contrast, a direct investment in money market instruments lacks this divisibility.

Diversification The MMF diversifies its portfolio by purchasing instruments of a wide variety of issuers. This might expose investors in the fund to lower levels of risk than if they invested their funds directly in the money market.

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[2] The functions of financial intermediaries are discussed in Van Horne [13].

Of course, these two explanations for the growth of MMFs are not mutually exclusive. In fact, the central conclusion of this article is that the growth of MMFs has been due to both (1) their ability to provide access to the money market to those previously excluded and (2) the advantages they offer some investors as an alternative to direct investment in the money market. This conclusion is based on a discussion, presented in Section I of this paper, of the factors influencing the participation in MMFs by the three major categories of MMF investors, and on estimates, presented in Section III, of the sources of MMF growth. Section II discusses the determinants of the yields paid by MMFs to shareowners.

I. MONEY MARKET FUND INVESTORS

This section discusses the factors contributing to the attractiveness of MMFs for the three major categories of MMF investors. The sectors are discussed in the order of their importance as MMF investors as of the end of 1978. The two major categories of MMF investors are individuals and bank trust departments. The third most important investor category is corporations, although this sector holds a much smaller proportion of total MMF shares than individuals and bank trust departments. This ordering—(1) individuals, (2) bank trust departments, and (3) corporations—is also the order of the relative importance of access to money market yields as an explanation for the use of MMFs by these investors. That is, this explanation appears to be an important one underlying the use of MMFs by individuals. The access explanation applies to a lesser extent to bank trust departments and appears to be of negligible importance as an explanation for corporate use of MMFs. For these investors, and also for those individuals who do have access to the money market, the other advantages offered by the MMF as a financial intermediary for short-term funds appear to provide the primary explanation for the use of MMFs.

Individuals The role of MMFs in providing access to money market yields is the most prevalent explanation for the use of MMFs by individuals. According to this explanation, the small individual investor has been unable to earn market yields because of minimum purchase requirements in the money market and because regulations limit the rate that can be paid on time and savings deposits at depository institutions. MMFs are attractive to small savers because they provide a means to circumvent these obstacles.
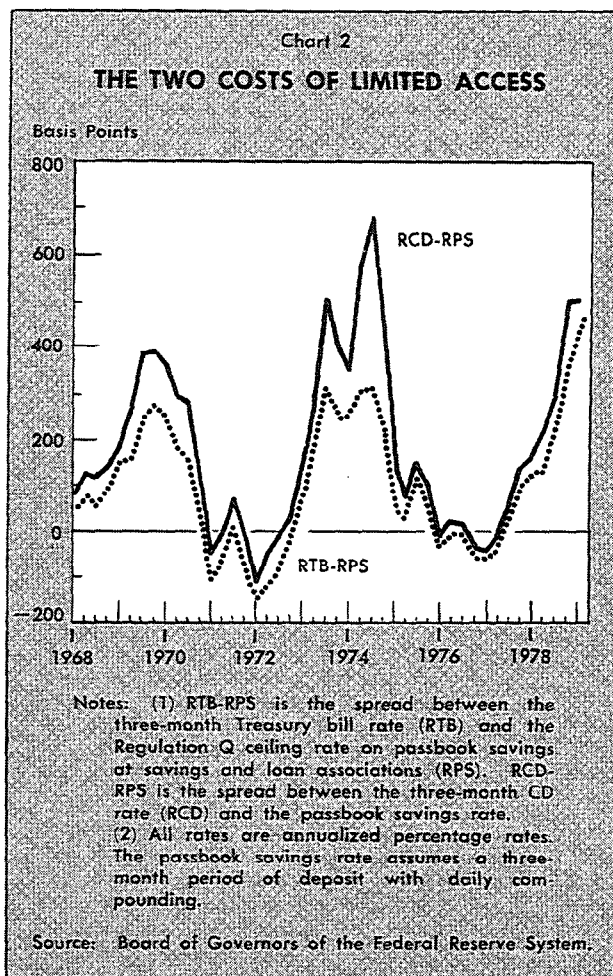
Purchases of money market instruments other than Treasury bills usually require investments of at least $25,000 and more often $100,000 or more. Furthermore, since 1969, purchases of Treasury bills have required a minimum investment of $10,000. In June 1978 banks and thrift institutions were authorized to issue 6-month "money market certificates" with maximum issuing rates tied to the average 6-month Treasury bill discount rate established at the weekly Treasury bill auctions. These certificates, however, carry the same minimum investment of $10,000 as Treasury bills. Consequently, the only short-term investment option facing the investor with less than $10,000 has been to deposit his funds in small time and savings deposits at the deposit institutions[3]. The rates paid on these deposits are subject to ceilings established under Regu-Q of the Federal Reserve Act.

In recent years most banks and thrifts have offered the maximum rates allowed by Regulation Q. Consequently, the spread between money market rates and Regulation Q ceiling rates is an indicator of the cost of limited access to the money market encountered by savers with less than $10,000 of short-term funds. Chart 2 shows the differentials between the 3-month Treasury bill rate and the Regulation Q passbook savings ceiling rate at thrift institutions (RTB-RPS) and between the 3-month certificate of deposit rate and the thrift passbook rate (RCD-RPS). The difference between the two lines is the differential between the 3-month CD and Treasury bill rates.

As shown in Chart 2, for much of the past decade money market interest rates have been significantly higher than the savings deposit ceiling rate. The magnitude of the spread between the 3-month Treasury bill rate and the savings deposit rate in such periods as 1973-74 and 1978-79 illustrates the disadvantage suffered in periods of high interest rates by individuals with less than $10,000 to invest. For these individuals MMFs are attractive because they provide the only access to going money market yields.

Even for individuals possessing the $10,000 needed to invest in Treasury bills or money market certifi-

Chart 2
THE TWO COSTS OF LIMITED ACCESS

Notes: (1) RTB-RPS is the spread between the three-month Treasury bill rate (RTB) and the Regulation Q ceiling rate on passbook savings at savings and loan associations (RPS). RCD-RPS is the spread between the three-month CD rate (RCD) and the passbook savings rate. (2) All rates are annualized percentage rates. The passbook savings rate assumes a three-month period of deposit with daily compounding.

Source: Board of Governors of the Federal Reserve System.

cates, there may be circumstances under which limited access to the yields of other types of money market instruments influences their decision to use MMFs. Chart 2 shows that in past periods of high interest rates, Treasury bill rates have often been well below other money market rates. For instance, the spread between the quarterly average 3-month CD and Treasury bill rates reached levels of 350 basis points in mid-1974 and in 1978 was as high as 150 basis points. In periods of rising spreads between the rates of other money market instruments such as CDs and commercial paper and the rate on Treasury bills, the yields paid by many money market funds will rise relative to the yield on bills. In these circumstances individuals holding bills or money market certificates may use MMFs to gain access to yields on money market instruments other than bills.[4]

While the role of MMFs in providing small savers access to money market yields has undoubtedly been

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[3] Actually, there are two minor exceptions to this statement. First, as of July 1979, small savers have been allowed to pool their funds to meet the $10,000 minimum necessary to purchase money market certificates. Second, long-term U. S. government securities are issued in denominations of less than $10,000. As these securities approach maturity they effectively become short-term investments. Transactions costs, however, substantially reduce the yield of such an investment to the small investor.

[4] This assumes that the rise in the spread between CD and Treasury bill yields was not solely due to an increase in default risk. This argument is made by Cook [6].

an important factor contributing to the use of MMFs by individuals, evidence on average size of individual MMF accounts, presented later in the paper, indicates that many individuals who have sufficient funds to invest directly in money market instruments, or at least in Treasury bills, are also using MMFs. For these individuals the benefits of financial intermediation, not access, provide the key attraction of MMFs. This is an important distinction because it implies that even in the absence of Regulation Q ceilings at the deposit institutions, individual use of MMFs would continue.

Two uses of MMFs by individuals deserve special attention because they represent innovations in the management of liquid assets. The first innovation is the large-scale use of MMFs by stockbrokers for the purposes of investing their clients' balances. Many large brokerage firms have established their own MMFs. Most of these are open to the general public but are used mainly by the brokers of the firm as a liquid parking place for investors' funds that become available after a sale of stock shares, bonds, etc. Many brokers unaffiliated with a MMF use MMFs for the same purpose. Previously after a sale of securities, an investor's funds would either have remained uninvested, been placed in a savings account or a relatively low-yielding account offered by the broker, or been invested directly in a money market instrument if the amount of funds made this possible. The increased liquidity and divisibility MMFs provide relative to direct money market investment are probably especially important to this type of investor. Consequently, as a competitive measure, many brokers are using MMFs to ensure that their investors remain fully invested at market rates.

The second innovation is the use of exchange privileges between MMFs and other funds in a mutual fund group. These arrangements allow MMF investors to exchange their MMF shares for shares in any of the other mutual funds in the group, at that fund's share price, plus a sales charge if it is a load fund. Also, shareholders in any of the other funds can exchange their shares for the MMF shares. The exchange privilege offers individual investors the benefit of added flexibility in their investment decisions, allowing them to move in or out of differing types of mutual funds with little or no transactions costs. Just under half of the mutual fund groups whose share prices are listed in the *Wall Street Journal* have established MMFs.

Bank Trust Departments The second important user of money market funds is bank trust departments. Trust departments serve as fiduciaries for numerous types of accounts which can broadly be divided into two groups: (1) personal trusts and estates and (2) employee benefit accounts. If funds from these accounts were invested separately, many of the potential advantages of intermediation, such as diversification and reduced administrative costs, would be lacking. Furthermore, individual accounts of the bank trust department can have the same kind of limited access problem faced by individual investors. Some of these accounts have less than $10,000 in short-term assets. Consequently, the only available short-term investment is time and savings deposits which, as shown above, has frequently paid rates well below money market rates.

In order to gain the advantages of intermediation, trust departments can establish "collective investment funds" under Regulation 9 of the Comptroller of the Currency. Collective investment funds for accounts of personal trusts and estates are called "common trust funds." Collective investment funds pool monies from different accounts of the trust department and invest them collectively. Two types of collective investment funds have developed for the investment of short-term funds. The first type to evolve was the "variable amount note" (also called a "master note"), which is a revolving loan agreement, generally without a specified maturity, negotiated with a business borrower.[5] Monies from various accounts in the trust department can be put into the variable amount note and withdrawn from it without fees as the need arises. The rate paid by the borrower of the variable amount note is most commonly the "180 day commercial paper rate placed directly by major finance companies" posted in the *Wall Street Journal*.[6]

While the variable amount note is widely used by bank trust departments, it has some limitations. First, the participating accounts gain little in the way of diversification. Second, the agreement with the borrower typically specifies maximum and minimum limits between which the size of the variable amount note must vary. These limitations reduce the liquidity of a variable amount note investment and may necessitate agreements with several borrowers, each of which requires a separate plan, thereby increasing administrative expenses.

As a result of the weaknesses of the variable amount note, a second type of collective investment funds for short-term investments, called a "short-

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[5] The variable amount note is a type of collective investment fund established under Regulation 9.18(c)(2)(ii) of the Comptroller of the Currency.

[6] See [1], p. 25.

term investment fund (STIF)," has grown in usage by bank trust departments. STIFs are essentially MMFs operated by the bank trust departments for their own accounts. The STIF pools funds from individual accounts of the trust department and invests those funds in a variety of short-term money market instruments.

Almost all STIFs fall into two broad categories. The first group is for accounts of personal trusts and estates. These STIFs, operated under Regulation 9.18(a)(1) of the Comptroller of the Currency, receive tax-exempt status under the condition that income earned by the fund is distributed to participating accounts. These STIFs are also limited by the requirement that no participant can have an interest exceeding 10 percent of the value of the fund. The second type of STIF, operated under Regulation 9.18(a)(2) of the Comptroller of the Currency, is for the accounts of pension, profit sharing, stock bonus, thrift, and self-employed retirement plans that are exempt from taxation under the Internal Revenue Code. Because the contributing accounts are themselves tax-exempt, the second type of STIF does not have to distribute income to the participating accounts in order to acquire tax-exempt status. In addition, this type of STIF is not subject to the requirement that no participant's interest exceeds 10 percent. Under IRS regulations, monies of personal trust and estate accounts and "tax-exempt" accounts cannot be mixed. Hence, if a bank trust department wishes to provide STIF services to both types of accounts, it must establish both a 9.18(a)(1) STIF and a 9.18(a)(2) STIF.

Unlike all other types of collective investment funds, which have to value their assets on a current market basis, STIFs are permitted to value their assets on a cost basis and use the "straight-line accrual" method for calculating income of the trust. Under this method the difference between cost and anticipated redemption value at maturity is accrued in a straight-line basis. This accounting procedure is generally preferred by trust departments because it smooths out the flow of income to participating accounts. (An expanded discussion of straight-line accrual versus market valuation accounting methods is given in the Box.) In granting this exemption to STIFs, the Comptroller of the Currency has imposed fairly strict restrictions on the portfolios of STIFs. They are:

1. 80 percent of investments must be payable on demand or have a maturity not exceeding 91 days,

2. assets of the fund must be held to maturity under usual circumstances,

3. not less than 40 percent of the value of assets of the fund must be composed of cash, demand obligations, and assets that mature on the fund's next business day.[7]

If bank trust departments have the option of operating a STIF, why do so many use money market funds? There are two possible answers to this question. The first is that restrictive regulations on STIFs induce bank trust departments to use MMFs, at least for some of their accounts. STIFs are affected by both Comptroller of the Currency regulations and various state regulations. As explained above, the Comptroller of the Currency's regulations impose fairly stringent conditions on the portfolios of STIFs. In addition, regulations require that separate funds be established for accounts of personal trusts and estates and for employee benefit plans. Furthermore, under Comptroller of the Currency regulations, agency accounts of personal trusts and estates are not permitted to invest in common trust funds. Agency accounts are those for which the owner retains title to the property and only delegates to the bank trust department certain responsibilities.

The state regulation most seriously affecting the establishment of STIFs was a New York law that imposed heavy reporting requirements on STIFs for personal trust and estate accounts.[8] As a result of these requirements, almost no 9.18(a)(1) STIFs have been established in New York. Since at the end of 1977 New York bank trust departments had 29.3 percent of all trust department assets, this regulation probably directed a significant amount of money to MMFs that otherwise might have gone into STIFs. The heavy reporting requirements on STIFs were eliminated by a revision in the New York law passed in mid-1979.

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[7] The aggregate portfolio of STIFs appears to reflect the Comptroller of the Currency's regulations. In a survey of collective investment funds at the end of 1978 conducted by the Comptroller of the Currency, 24 percent of total STIF assets was variable amount notes ("master notes"), 56.9 percent was commercial paper, 4.3 percent was U. S. Treasury and agency securities, and .8 percent was cash. The remaining 14 percent was mostly time and savings deposits, although a small part was bankers' acceptances and repurchase agreements. (Because of the way the data were collected, it was not possible to separate CDs from other time and savings deposits.)

[8] The New York law required a periodic accounting from common trust funds for personal trust and estate accounts before the surrogate court. This accounting required a record of all transactions of the fund. Because of the volume of transactions of a STIF, this required accounting discouraged N. Y. banks from establishing 9.18(a)(1) STIFs.

MMF ASSET VALUATION AND YIELD DETERMINATION

There are two commonly used methods of valuing a MMF's portfolio of assets and of calculating yields: the mark-to-market and the amortized cost or straight-line accrual methods. The issue of the most appropriate method has been hotly debated. The following paragraphs describe the various accounting techniques and then explain the arguments in the controversy over which method is more appropriate for MMFs.

The most important distinction between the accounting policies of MMFs is in the method used to determine the asset value of the investment portfolio. Marking-to-market, as its name implies, involves appraising portfolio assets at their estimated market value. In the case of securities for which active secondary markets exist, this means valuing the security at its most recent bid price, or alternatively, at the mean of the most recent bid and asked prices. Securities which are not actively traded, such as commercial paper, are generally valued by comparison with marketable securities of similar type, yield, quality, and time to maturity.

In contrast to mark-to-market, amortized cost valuation does not allow changes in market interest rates to affect the value of the MMF's portfolio. The amortized cost method establishes the cost of a security on the date of purchase (or sometimes the market value on a date after purchase) as its "fair value." The difference between the security's cost and its redemption value at maturity is accrued daily on a straight-line basis as an increase in the value of the asset.

Under both mark-to-market and amortized cost methods of valuation, "net asset value" of a fund is the calculated asset value of the portfolio minus the "income" earned that day. The fund's net income, income minus expenses, is credited to shareholders' accounts daily and usually paid monthly. The MMF's share price is the net asset value divided by the number of shares outstanding.

The amortized cost valuation method leads to a constant share price because each security's value is "locked in" on the purchase date and the straight-line increase in its value (the income earned on the security) is credited as dividends, after expenses are deducted, to shareholders daily. The net asset value per share could change only if the MMF found it necessary to sell a security at a price different from its asset value determined by amortized cost or if the issuer of one of the securities in the portfolio defaulted.

Among MMFs that value by marking-to-market there is considerable variation in the method of determining share price. There are three methods:

(1) Many MMFs maintain a constant share price, usually $1.00, allowing the number of shares owned by each shareholder to vary. Interest income and capital appreciation (realized or unrealized) net of expenses accrue daily to the shareholder in the form of additional shares. If the MMF's expenses and capital depreciation are greater than its interest income that day, each

investor's shares will be correspondingly reduced.

(2) Another group of MMFs ordinarily maintains a constant share price, but reflects increases in portfolio value by increasing dividends. Similarly, a depreciating portfolio is reflected in reduced dividends. In the event that unrealized and realized capital losses plus expenses are greater than daily interest income, the MMF will first respond by reducing dividends already credited to shareholders during the month, and if this is not sufficient, the MMF will lower its share price.

(3) Unlike the other two groups of MMFs that mark-to-market, a third group does not include unrealized capital gains or losses in the calculation of income but allows the net asset value and the share price to fluctuate with market interest rates. If rates rise (fall), the share price will fall (rise). The extent of the change in share price will depend on the maturity schedule of the portfolio and the magnitude of the change in market rates. In this case, the shareholder has two variables to monitor to determine his effective yield: dividends and share price.

The distinctive feature of amortized cost valuation is that it isolates the share pricing and daily yield determination from the fluctuations of the market. The greater stability, both in principal and in daily yield, that this method leads to, relative to the mark-to-market method, is very appealing to certain institutional investors, especially bank trust departments, who have difficulty justifying to their clients yields that vary widely from day to day. For these reasons, most trust departments consider amortized cost to be the preferable valuation method, and some even consider MMFs using mark-to-market valuation to be an unacceptable form of investment.

Despite the preference of bank trust departments for amortized cost valuation, the Securities and Exchange Commission has stated in an interpretative release that MMFs may use amortized cost valuation only for securities of 60 days or less to maturity and that mark-to-market valuation must be used for securities of longer maturity.[1] The Commission has argued that amortized cost is an inappropriate method of determining the asset value of securities of more than 60 days to maturity because it does not take into account changes in market value and, therefore, the interest of existing shareholders could be diluted under certain circumstances. Such a situation could occur if market interest rates rise (fall) and there are substantial net redemptions (sales) of the MMF's shares.

For instance, if interest rates rise, the market value of the MMF's assets will fall below the value "locked in" by amortized cost valuation. (The extent of the fall is directly related to the length of maturity of the fund's portfolio.) Hence, the MMF's assets are "overvalued" in the sense that the fund is carrying them at a value above their market value. If share redemptions subsequently exceed sales and if the fund

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[1] SEC Release, No. IC-9786, May 31, 1977.

is forced to sell securities prior to maturity to meet redemption requests, these securities are sold at prices below that at which they are valued by the fund. Shareowners redeeming their shares are paid the constant share price, but remaining shareholders are stuck with a portfolio of lower asset value per share. This must be reflected in lower dividends or a reduced share price for remaining shareholders.

In the case of falling interest rates, the appreciation of portfolio assets accrues immediately to existing shareholders under mark-to-market valuation. But under amortized cost, this benefit accrues in the form of higher (relative to the market) daily income. If share sales exceed redemptions, however, this benefit must be spread across more shares. As a result, the return to existing shareholders is diluted.

Although some MMFs, many of them dealing exclusively with institutions, have sought permission to use amortized cost, the SEC has continued its efforts to restrict the use of amortized cost. The Commission did grant temporary exemptions under certain conditions in November 1977 to 10 MMFs and shortly afterwards to 4 others, until full judicial disposal of the matter. However, prior to the beginning in November 1978 of the hearing that was to resolve the issue, the majority of the funds involved arrived at a compromise.[2] They agreed to use mark-to-market valuation for assets of more than 60 days to maturity and to maintain a dollar-weighted average maturity of 120 days or less (to minimize fluctuations in asset value). In return they were permitted by the SEC to price their shares to the nearest one penny on a $1.00 share price ("penny rounding") instead of the one-tenth of a penny accuracy the SEC had previously required.

"Penny-rounding" was considered an adequate alternative to amortized cost by the MMFs who joined this agreement, because it was thought to enable the funds to maintain a constant share price and thus provide a very stable investment for institutions. The MMF's share price would not diverge from $1.00 unless the fund's net asset value per share went to $0.9949 or $1.0050, an event thought unlikely given the agreed restriction on the maturity of the portfolio.

Some bank trust departments found even this valuation method unacceptable. One MMF that had used amortized cost but agreed to the penny-rounding compromise lost one bank trust department's investment of $44 million. The MMFs involved in the legal dispute that did not agree to the penny-rounding compromise have continued the litigation over the use of amortized cost. At the time of writing, offers of settlement which, if accepted, would allow the use of amortized cost under certain restrictions have been filed by the MMFs participating. The SEC's Division of Investment Management has recommended these offers of settlement be approved. The decision of the Commission is pending.

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[2] SEC Release, No. IC-10451, October 26, 1978.

While the regulations cited above may have had some impact on the decision of bank trust departments to use STIFs, the advantage of size in the operation of short-term financial intermediaries, such as STIFs and MMFs, has probably been a more important determinant. According to this line of reasoning, small- and medium-sized bank trust departments use MMFs rather than establishing STIFs because the greater size of MMFs enables them to better provide the benefits of intermediation discussed earlier. A potentially key benefit is economies of scale resulting in lower average costs for large MMFs (and large STIFs) than for relatively small STIFs. In the presence of these economies of scale, small- and medium-sized trust departments could earn a higher yield *net* of expenses for their accounts by placing their short-term funds in MMFs than by establishing STIFs.

If this second explanation for the use of MMFs by bank trust departments is accurate, there should be a positive relationship between the size of bank trust departments and their use of STIFs. That is, larger bank trust departments should be more likely to establish STIFs than smaller bank trust departments. A survey of collective investment funds at the end of 1978 provides convincing evidence of this relationship. This survey, done by the Comptroller of the Currency, covered almost 1000 bank trust departments and included almost all of those that operate collective investment funds. Ninety-six banks in the survey had STIFs.[9] Of these, 68 were national banks. By comparing the bank trust departments in this group with the total universe of national bank trust departments, it is possible to get a distribution of STIFs according to size of bank trust department. This distribution is shown in Table I. The table shows negligible use of STIFs by bank trust departments with less than $100 million in assets and only slight use by trust departments with $100 million to $500 million in assets. In contrast, 38.5 percent of the trust departments with assets of $500 million to $1 billion had STIFs and 64.6 percent of the departments with assets of greater than $1 billion had STIFs.[10] Finally, it

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[9] These 96 banks operated a total of 147 STIFs. Total assets of these STIFs were $15.2 billion. Seventy-six of the STIFs, with $4.4 billion of assets, were 9.18(a)(1) funds, while 69 of the STIFs, with $10.4 billion of assets, were 9.18(a)(2) funds. The other two funds were covered by Section 9.18(c)(5) of Regulation 9.

[10] All of the percentages in Table I may be understated somewhat because the data on STIFs were collected from the common trust fund survey before the survey was checked for delinquencies. This would not, however, have a significant effect on the relative magnitude of the percentages shown in Table I.

THE DISTRIBUTION OF STIFs
BY SIZE OF BANK TRUST DEPARTMENT

(National Banks Only)

Size of Bank Trust Department	No. of Trust Departments	No. of Trust Departments with STIFs	Percent
Less than $10 million	960	0	0.0
$10 to $25 million	248	1	0.4
$25 to $100 million	295	2	0.7
$100 to $500 million	191	19	9.9
$500 million to $1 billion	39	15	38.5
More than $1 billion	48	31	64.6

Note: Bank trust departments reporting zero assets were excluded from the sample. The bank trust department distribution is as of December 31, 1977; the STIF survey data were collected for fiscal year end dates ranging over 1978.

Sources: "Common Trust Fund Survey—1978," Comptroller of the Currency; "Trust Assets and Number of Accounts of National Banks With Trust Departments as of December 31, 1977," Comptroller of the Currency.

should be noted that many bank trust departments that have STIFs nevertheless use MMFs to some extent, especially for those agency accounts that are not permitted to be invested in common trust funds. STIFs, themselves, may also invest in MMFs as a means of satisfying the 40 percent liquidity requirement.

These survey results make it clear that size is the primary factor underlying a bank trust department's decision on whether or not to operate a STIF.[11] The third article in this *Review* provides empirical support for the contention that there are economies of scale in the operation of financial intermediaries for short-term funds. These economies of scale provide an explanation for the decision of small- and medium-sized trust departments to use MMFs rather than operate their own STIFs.

Corporations A third category of MMF investors is nonfinancial corporations. While this sector has a very large amount of funds held in short-term financial assets, its use of MMFs to date has been limited relative to individuals and bank trust departments. In discussing the attractiveness of MMFs as an investment alternative for nonfinancial corporations, it is useful to consider two components of corporate liquid financial holdings: (1) assets held for transactions purposes and (2) assets held for a

slightly longer period and usually invested in the money market.

MMFs and Transactions Balances As noted, most MMFs offer checking for amounts of $500 or more. The payment of explicit interest on demand deposits at banks is prohibited by the Banking Act of 1933. Since corporations hold a large amount of demand deposits, the opportunity to write large checks on MMF shares would appear to have created a potential role for MMFs in corporate cash management. The comparison of money market fund shares to demand deposits, however, is complicated by the fact that banks do pay an implicit rate of return on demand deposits. This return is paid in the form of lines of credit, use of credit, cash management services and other banking services. Clearly, MMF shares cannot be considered a substitute for demand deposits held to compensate a bank for services it alone provides. To the extent that the checking privilege of most MMFs can be substituted for this service provided by banks, however, MMFs may enable corporations to reduce the amount of compensating balances held.[12]

The regulatory prohibition of payment of interest on demand deposits has encouraged substantial corporate involvement in the repurchase agreement (RP) market. Corporate demand deposits in excess of compensating balances are often invested overnight in RPs arranged through the bank. A comparison of rates offered on RPs by government securities dealers and average MMF yields for 1978 and the first four months of 1979 shows very little difference.[13] As bank fees for investing in overnight RPs are likely to be higher than the cost of investing in MMF shares, which consists only of wire charges, MMFs appear to have offered corporations a competitive alternative to RPs in this period. Also, MMFs appear to provide an overnight investment opportunity for those corporations without sufficient funds to meet the substantial minimum purchase requirements on RPs.

Despite the fact that MMFs appear to represent a partial substitute for conventional means of holding

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[11] Bent [2] asked marketers of STIF computer packages at an ABA Midcontinent Trust Convention at what level a STIF made economic sense. The reply was that "a department with $500 million in assets would realize an advantage." That reply is consistent with these survey results.

[12] Also, there are some banking services that may be paid for in fees, rather than by holding compensating balances. To the extent that paying fees allows the corporation to economize on its demand deposit holdings, funds are freed for investment elsewhere. If the corporation wishes to keep these funds liquid, MMFs might be an attractive option.

[13] MMF yields used in this comparison are from **Donoghue's Money Fund Report** of Holliston, Mass. RP yields are averages of yields offered by government securities dealers.

transactions balances, evidence on MMF share turn-over rates strongly suggests that neither corporations nor other MMF investors have used MMFs extensively for transactions purposes. Turnover rates of demand deposits, savings deposits, and MMF shares are presented in Table II. These rates are measured as total debits or redemptions in a given month times 12 (to annualize) divided by the average level of deposits or shares outstanding. The data shown are for every third month beginning in July 1977, the first month the savings deposit turnover rates are available. Over the period shown in the table, the turnover rate of MMF shares varied from 3 to 4. In sharp contrast, the turnover rate of demand deposits was in a range of 128 to 157 per year. The turnover rate for MMF shares is about halfway between the turnover rates for business savings deposits and individual savings deposits. After adjusting for the greater percentage of business and other institutional money in MMFs, as opposed to savings deposits, the aggregate turnover rate for MMFs is remarkably similar to the aggregate turnover rate for savings deposits.

The aggregate MMF share turnover rates are so low, relative to demand deposit turnover rates, that they strongly indicate that corporations have not used MMFs for transactions purposes to any significant degree. It might be argued that since corporations hold a relatively small proportion of MMF shares, the aggregate data are masking heavy share turnover among some funds that deal more heavily with corporations. Examination of *individual* MMF turnover rates, however, provide little support for this conjecture. Turnover rate data for 40 individual MMFs over an annual period are listed in the accompanying article [7]. This group of 40 funds encompasses all types of funds, including those that deal only with institutions and some that deal heavily with corporations. Yet only 2 of the 40 funds had share

turnover rates greater than 8 in the period covered. One small fund had a turnover rate of 28, suggesting that its shares were being used for transactions purposes. In fact, this fund's turnover rate subsequently reached a level of over 100, but then dropped sharply to 2.

Two reasons can be advanced for the limited corporate use of MMFs for transactions purposes. First, certain features of MMF share purchase and redemption systems lessen the attractiveness of MMFs as a substitute for repurchase agreements. Secondly, MMFs may be unwilling to allow shares to turnover very rapidly.

The share purchase and redemption systems of almost two-thirds of MMFs surveyed prevent these MMFs from being used by corporations as a substitute for overnight RPs because a corporation can not invest in one of these MMFs one day, and receive payment with one day's dividends the following day. An investment in one of these MMFs entails the loss of one day's dividends (unless shares are redeemed by check), which results in a significant reduction in the rate of return of an investment placed for just a couple of days. Thus, these MMFs are not a substitute for overnight RPs, nor do they provide a competitive yield on an investment for just a few days.[14]

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[14] A survey of MMF prospectuses revealed that 39 of 61 MMFs in the survey effect share purchase and redemption orders once each business day at the close of the New York Stock Exchange. Dividends are declared each business day before share orders are processed. Therefore, at one of these MMFs, a purchase order effective on Monday is not credited with dividends until Tuesday. A redemption request on Tuesday would result in the shares being redeemed at the close of the NYSE that day. Remittance would not be sent until Wednesday at the earliest, with only one day's dividends. Check-writing redemption avoids the loss of a day's dividends because shares earn dividends up to and including the day the check is presented to the MMF's bank.

Table II

TURNOVER RATES AT COMMERCIAL BANKS AND MONEY MARKET FUNDS

	July '77	Oct. '77	Jan. '78	April '78	July '78	Oct. '78	Jan. '79	April '79
Demand Deposits	128.1	134.6	131.5	138.0	139.4	144.1	151.2	156.8
Savings Deposits								
All Customers	1.6	1.7	1.8	1.9	2.0	2.1	2.7	3.2
Business Customers	4.0	4.5	4.7	4.7	5.1	5.8	6.8	7.0
Others	1.5	1.5	1.7	1.8	1.8	1.9	2.5	3.0
Money Market Fund Shares	3.1	3.3	3.6	3.7	3.5	3.7	3.8	3.1

Note: Turnover rate for demand deposits are seasonally adjusted. Turnover rates for savings deposits and MMF shares are not seasonally adjusted.

Sources: Federal Reserve Bulletin; Donoghue's Money Fund Report of Holliston, Mass.

The share purchase and redemption policies of the remainder of the MMFs surveyed potentially allow the investor to avoid uninvested days. Thus, a corporation investing in one of these MMFs on Monday could earn one day's dividends and expect remittance on Tuesday.[15] However, MMF prospectuses rarely provide guarantees as to what day, let alone what time, remittance will be sent. A MMF's delay in remitting payment may mean lost investment opportunities and a lower effective yield for the corporation. Thus, the attractiveness of a very short-term MMF investment to a corporation may be diminished by the uncertainty as to when remittance can be expected, an uncertainty largely absent in repurchase agreements. Nevertheless, if one of the MMFs in this second group provides assurances of prompt remittance for redeemed shares, a MMF could offer corporations a competitive alternative to RPs depending on the relative net yields of the two forms of investment.

The second, and probably more important, reason for the limited use of MMF shares for transactions purposes is a degree of unwillingness on the part of MMFs to serve their shareholders' transactions needs. Rapid turnover of shares involves significant costs arising from bank charges for processing checks and the MMF's expenses when shares are redeemed. MMFs have not developed pricing systems that allocate these costs to individual shareholders who turnover shares rapidly. In the absence of such systems, MMFs sometimes find it necessary to simply restrict the turnover activity of some investors. A dramatic example is provided by the MMF, cited earlier, whose turnover rate reached a level of over 100 because one corporation was using this MMF extensively for transactions purposes. Subsequently, the corporation was asked to refrain from doing so and within a month the fund's turnover rate plummeted to 2.

This discussion is not meant to imply that under no circumstances would a MMF tolerate rapid turnover of its shares by an investor. The costs associated with a redemption of shares are relatively fixed, while the fees earned by the MMF's manager and advisor on an investor's funds are positively related to the size of the shareholder's investment. Hence, the willingness of a MMF to tolerate turnover by a given customer should increase with the average size of the customer's investment. For any share turnover rate there should be an average share level at which the MMF will permit that rate of turnover. If the investor is not maintaining that level then, under current institutional arrangements, the only options available to the MMF are to ask the investor to decrease the turnover rate of his shares or to refuse to accept new share purchase orders from the investor.[16]

MMFs Versus Direct Money Market Investment
Nonfinancial corporations also have a very large volume of direct investments in money market instruments such as CDs and commercial paper. The decision of a corporation to use an in-house program of direct investment in the money market or to use MMFs is solely dependent on which investment mechanism offers the highest net yield consistent with the desired degree of liquidity and diversification. Corporations do not appear to be significantly affected in this decision by government regulations. It should be noted, however, that small-sized corporations with savings deposits at the depository institutions are, like individuals, affected by Regulation Q ceilings. (There was $10.3 billion of corporate savings deposits outstanding in June 1979.)

Conversations with MMF officials reveal that those corporations that are using MMFs are at the smaller end of the size spectrum, which seems reasonable since corporations with smaller amounts of short-term funds available for investment are more likely to benefit from the advantages a MMF offers as a financial intermediary. The ability to offer these

[15] Shares can be purchased and redeemed in most of these MMFs on business days at noon and at 4 p.m. Eastern time. Dividends are credited just prior to the processing of share orders at either noon or 4, depending on the MMF, to shareholders of record. In the case that the MMF declares dividends at noon, for example, a purchase order effected at either noon or 4 p.m. Monday would first receive dividends at noon Tuesday. If the investor's redemption request was received before noon on Tuesday, shares would be redeemed at noon and payment with a day's dividends could be expected that afternoon.

[16] The rapid growth of MMFs in 1978 resulted in much speculation on the impact of MMFs on the growth rates of the monetary aggregates. Most of this speculation centered on whether or not MMFs were a factor contributing to the slowdown in the growth rate of M_1 in the fall of 1978. The main argument for the presence of an effect of MMFs on M_1 is that the liquidity of an investment in MMFs—especially the check-writing feature—makes them a virtually perfect, interest-earning substitute to M_1 for transactions purposes. This argument fails to take into account the almost universal minimum $500 requirement on checks. Nor does it consider the two factors limiting the use of MMFs for transactions purposes discussed in this section. In any case the MMF share turnover rate data provide virtually no support for the position that MMFs have served as a close substitute for demand deposits.

advantages is a corollary of the MMF's portfolio size. The greater size of the MMF's portfolio may enable the small corporation to gain greater liquidity and diversification than it could get by running an in-house money market investment program. Also, if there are economies of scale in the operation of corporate money market investment programs, as there appear to be in the operation of MMFs [7], the small corporation may gain a higher net yield by investing through a MMF than through an in-house program.

II. MONEY MARKET FUND YIELDS

The assumption that MMFs offer rates of return comparable to money market rates underpin the two broad explanations advanced above for the rapid growth of MMF assets. The first emphasized the ability of MMFs to provide money market rates to those previously denied access. The second explanation emphasized the advantages offered to some investors by MMFs which act as an intermediary for short-term funds. One such advantage is that, due especially to economies of scale, some investors can gain a higher net rate of return by investing in a MMF than by investing directly in the money market. As both explanations depend heavily on the assumption that rates of return on MMF investments and on other money market instruments are comparable, this section will examine the relationship between MMF and money market yields. The following section analyzes the growth of MMF assets in the context of a MMF yield series developed below.

A crucial distinction must be made in comparing MMF rates with money market rates. When purchasing a money market security, the investor is quoted a rate of return that he will receive if he holds that security to maturity, assuming the issuer does not default. A purchaser of MMF shares, on the other hand, receives no quotation as to what return he will gain if he holds his shares for a certain period. Rather, a yield quoted to the investor on the date of purchase indicates the annualized net yield received on an investment in the MMF over the *past* day, week, month, or year. The actual yield received by the MMF investor is determined after he purchases his shares, and is influenced by many factors. These factors are (1) the general level of money market yields, (2) the composition of assets of the MMF, (3) the expenses of the fund absorbed by its shareowners, (4) the movement in interest rates over the period shares are held and (5) the accounting procedure used by the fund to calculate share prices and daily dividends.

The MMF investor's yield is fundamentally dependent on the interest accrued daily on the MMF's ever-changing portfolio of securities. The amount of interest accrued depends on the general level of money market yields and on the type and maturity of securities held at a given time. MMFs vary considerably in both the type and average maturity of securities held. A large percentage of most MMFs' holdings are in domestic and Eurodollar CDs, commercial paper and Treasury bills, but various other high grade money market instruments are also commonly purchased. A small number of MMFs have restricted their portfolio investments to purchases of government securities, apparently to attract more risk-averse investors. Chart 3 shows the asset composition of all MMFs from the third quarter of 1975 to the first quarter of 1979. The aggregate asset composition of MMFs appears to be quite responsive to changes in yield differentials. For instance, the large spread between Treasury bill rates and other money market rates in the latter half of 1978 resulted in a significant movement out of government securities.

Another important determinant of the yield received by an investor in a MMF is the expenses deducted from the income of the fund before dividends are declared each day. The percent of net expenses (total expenses minus expenses absorbed

Chart 3
ASSET COMPOSITION OF MONEY MARKET FUNDS

Source: Investment Company Institute.
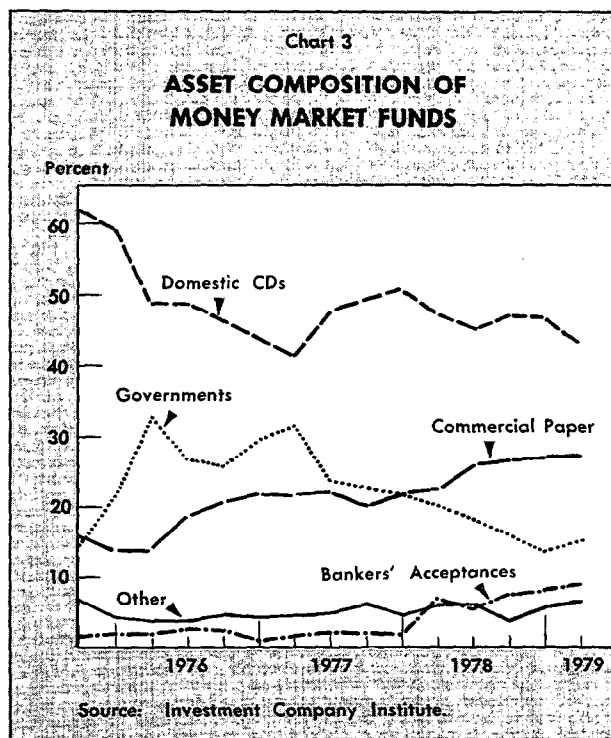
by the fund's administrator) to average assets on an annual basis varies in a range from 0.4 to 1.4, although most funds have net expense ratios of 1.0 percent or less. MMF expenses are discussed in more detail in the third article in this *Review*.

The extent of movement in market interest rates over the period shares are held also affects the investor's yield. These movements affect the rate earned on new assets of the MMF and also result in capital gains or losses on the assets already held by the MMF. The magnitude of the gains or losses is inversely related to the average maturity of the MMF's assets. The shorter the average maturity, the less the change in market value of the MMF's portfolio resulting from a given change in market rates.

The influence of capital gains and losses on the MMF's yield depends on the accounting procedures used by the fund. Some funds, using "mark-to-market" accounting procedures pass on these gains or losses (whether realized or not) on a daily basis. Others, using "amortized cost" accounting methods, do not allow unrealized capital gains or losses to affect yield. The yield of an investor in a MMF that uses amortized cost valuation may be affected by net redemptions (sales) of the MMF's shares in periods of rising (falling) market rates. The accounting methods used by MMFs have been the center of substantial controversy, not yet fully resolved. The Box describes in greater detail the various accounting methods used by MMFs and outlines the nature of the controversy.

As noted above, all quoted MMF yields are *ex post* yields, based on the behavior of a MMF over a certain period of time in the past. By contrast, the quoted rate on a money market instrument represents the promised yield on a security held to maturity. In order to compare MMF yields with money market yields it is useful to construct an *ex ante* yield series for MMFs that would be similar in concept to yield-to-maturity series for money market instruments. Table III presents such an *ex ante* average yield series for the five largest MMFs by asset size. The series was constructed using money market rates and MMF asset composition and average maturity data. Specifically, each MMF's *ex ante* yield for each month was determined by calculating the yield-to-maturity on a portfolio with the same asset composition as the MMF, under the assumption that each security in the portfolio matured in the number of

days equal to the average maturity of the MMF's assets. The *ex ante* yield series was then calculated using an asset-weighted average of the five MMFs' *ex ante* yield series. Finally, 60 basis points were subtracted from each month's annualized yield to form a yield series net of expenses. This 60 basis points figure is roughly equal to the average annual expense ratio over the 1975-78 period of the five MMFs that were most consistently among the largest five MMFs.

Table III

AVERAGE EX ANTE YIELD SERIES FOR FIVE LARGEST MMFs

Date		Yield	Average Maturity (Days)	Date		Yield	Average Maturity (Days)
Oct.	1975	5.90	78	Aug.	1977	5.39	90
Nov.	1975	5.36	86	Sept.	1977	5.65	83
Dec.	1975	5.41	79	Oct.	1977	6.00	75
Jan.	1976	4.68	119	Nov.	1977	6.01	88
Feb.	1976	4.75	125	Dec.	1977	6.02	87
Mar.	1976	4.80	113	Jan.	1978	6.34	82
Apr.	1976	4.49	104	Feb.	1978	6.27	87
May	1976	4.95	95	Mar.	1978	6.21	91
June	1976	5.27	94	Apr.	1978	6.40	80
July	1976	4.98	104	May	1978	6.73	76
Aug.	1976	4.87	111	June	1978	7.31	69
Sept.	1976	4.82	115	July	1978	7.44	65
Oct.	1976	4.46	111	Aug.	1978	7.51	75
Nov.	1976	4.38	107	Sept.	1978	8.14	68
Dec.	1976	4.10	122	Oct.	1978	8.66	60
Jan.	1977	4.31	105	Nov.	1978	9.55	52
Feb.	1977	4.25	108	Dec.	1978	9.96	50
Mar.	1977	4.28	98	Jan.	1979	9.56	50
Apr.	1977	4.28	105	Feb.	1979	9.54	54
May	1977	4.99	97	Mar.	1979	9.45	50
June	1977	4.87	102	Apr.	1979	9.28	48
July	1977	4.93	96				

Note: The average ex ante yield series for the five largest MMFs was constructed in the following way: (1) Asset composition and average maturity data for the five largest MMFs (by asset size) in each month were collected from Donoghue's Money Fund Report of Holliston, Mass. (2) Each MMF's entire portfolio was assumed to mature in the number of days given by the MMF's average maturity. Yields for each type of security held were determined from 1-month, 3-month, and 6-month yield series by extrapolation and interpolation assuming a linear term structure. For securities for which yield data were not available, such as RPs and securities in the "other" category, the yield was assumed to be the simple average of the yields on other securities in the portfolio. All yields were converted into annualized percentage rates. (3) The ex ante yield for each MMF in each month was calculated as the average yield on the securities held, weighted by the percentage of each security type in the portfolio, minus 60 basis points for expenses. (4) For each month, an asset-weighted average yield and an asset-weighted average maturity were found for the five MMFs.

Sources: Salomon Brothers, Bond Market Roundup; Donoghue's Money Fund Report of Holliston, Mass.
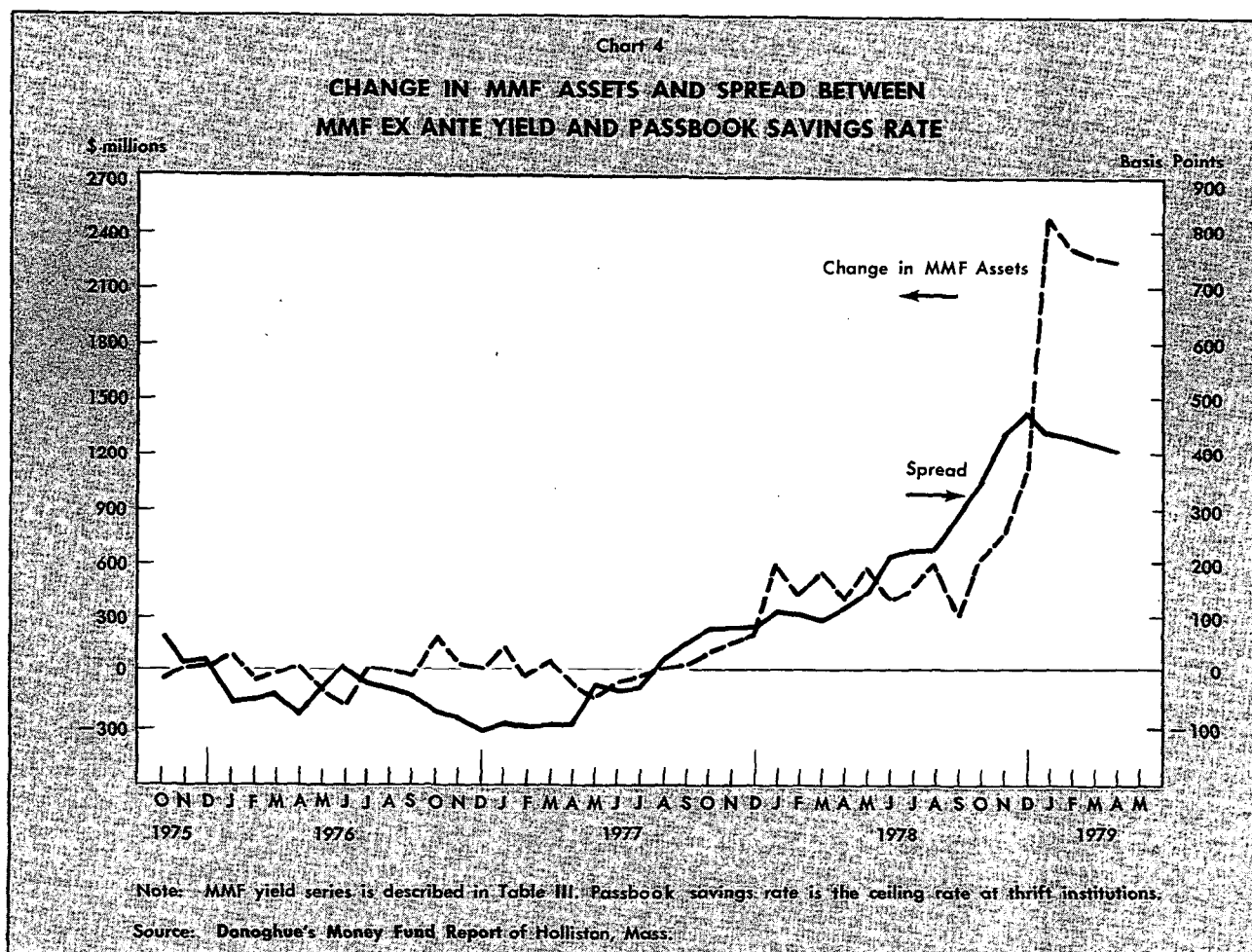
The *ex ante* yield series is a rough estimate of the net yield that could be expected from a MMF investment held at the time indicated over the period given by the average maturity of the MMFs' portfolio.[17] The series is comparable to yields on money market instruments except that the maturity of the MMF portfolio varies and the MMF yield series is net of investment costs. Thus, the series is useful in showing the relative attractiveness of a MMF investment at a given time. The yield that should be compared to this MMF yield series depends on the investor in question. For individuals with less than $10,000 to invest, the relevant alternative rate is the Regulation

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[17] The implicit assumption underlying the construction of the **ex ante** yield series is that interest rates remain constant over the period given by the average maturity. Expectations of interest rate fluctuations will affect the expected MMF yield for two reasons. First, as securities mature new assets are purchased at different rates. Second, under the mark-to-market method of valuing MMF portfolios, the capital gains or losses on the MMF's portfolio associated with interest rate fluctuations will accrue to shareholders whether they are realized or not.

Q ceiling rate on savings deposits and small short-term time deposits. For individuals with greater than $10,000, it is the yield on Treasury bills and money market certificates at depository institutions. And for investors with sufficient funds to invest in other money market instruments, such as commercial paper and CDs, it is the yield on these instruments. Of course, as noted, the yields on money market instruments are gross yields whereas the MMF yield series is net of expenses.

III. GROWTH OF MMFs

Chart 4 compares (1) the differential between the *ex ante* money market fund yield series derived above and the Regulation Q ceiling rate on savings deposits at thrift institutions with (2) monthly changes in the dollar volume of MMF shares outstanding. The chart shows that MMFs experienced little net contraction in assets during 1976 and the first half of 1977, despite *ex ante* MMF yields that were well below the Regulation Q ceiling rate for savings de-

Chart 4
CHANGE IN MMF ASSETS AND SPREAD BETWEEN
MMF EX ANTE YIELD AND PASSBOOK SAVINGS RATE

Note: MMF yield series is described in Table III. Passbook savings rate is the ceiling rate at thrift institutions.

Source: Donoghue's Money Fund Report of Holliston, Mass.

posits. After the spread between the *ex ante* MMF rate and the savings deposit rate rose to roughly 100 basis points in late 1977 and early 1978, MMF assets increased by $0.5 billion per month on average. The monthly changes in the dollar volume of MMF shares outstanding remained at that level throughout most of 1978, while the spread between the *ex ante* yield series and the savings deposit rate rose to 200 basis points in the middle of the year. After market interest rates increased further in the fall of 1978, however, the monthly increases in money market fund shares rose sharply. By the first month of 1979, the increase in MMF shares was over $2 billion per month and the monthly increase remained at that level through the first five months of 1979.

The rough association between the rise in the spread between the MMF yield series and the Regulation Q ceiling rate and the increases in money market fund shares explains the belief that the growth of MMFs was solely a result of funds being withdrawn from the deposit institutions and put into MMFs. According to this view, the only function served by MMFs is to provide access to money market yields to individuals having relatively small amounts of funds to invest. While it is undoubtedly true that a significant part of the growth of MMFs has resulted from the withdrawal of funds by individuals from the deposit institutions, the position taken in this article is that much of the growth over this period also represented a lasting change in the way some investors manage their short-term assets. The best example of this fundamental change is the case of small- and medium-sized bank trust departments, which use MMFs to manage their short-term assets in order to take advantage of the economies of scale resulting from the pooling of large amounts of funds.

The answer to the question of whether the growth in MMFs is simply a result of government regulations or whether it also is due to other advantages MMFs offer investors as a financial intermediary would be aided by a breakdown of money market shares by investor category. Large investors, such as bank trust departments and corporations, have access to the money market. Hence, growth in those sectors cannot be attributed primarily to Regulation Q. While there are no comprehensive data on ownership of money market fund shares by type of investor, there is some useful information.

Beginning in late 1977, a number of funds began to limit their investors to institutions (i.e., all investors except individuals) and to require minimum

initial investments of $50,000.[18] It is possible to derive a series beginning at that point in time for funds that deal only with institutions. This series does not include all institutional money in MMFs, since many of the other MMFs also have significant amounts of institutional money. Chart 5 shows the growth of MMFs divided into three groups: (1) those MMFs that deal only with institutions, (2) general purpose MMFs sponsored by stockbrokers and (3) other general purpose MMFs.[19] Many of the MMFs in the third group are part of a fund group having a variety of different mutual funds. The chart shows that the group of MMFs excluding individual investors had grown to $6.5 billion by the end of May 1979.

Information on the relative ownership of shares by institutions and individuals is also provided by a survey conducted by the Investment Company Institute [10] at the end of 1978. The survey estimated

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[18] These restrictions were imposed as part of an agreement with the SEC. Under this agreement these MMFs were given temporary permission to use straight-line accrual accounting methods under certain conditions. Two of these conditions were that the MMFs restrict themselves to institutional investors and set minimum account size at $50,000.

[19] This classification and the data used to construct the series are taken from **Donoghue's Money Fund Report** of Holliston, Mass.

Chart 5
GROWTH OF MMF ASSETS BY TYPE OF FUND

Assets ($ Billions)

--- General Purpose MMFs
— Institutions only MMFs
..... Stockbroker-Sponsored/General Purpose MMFs

Source: Donoghue's Money Fund Report of Holliston, Mass.
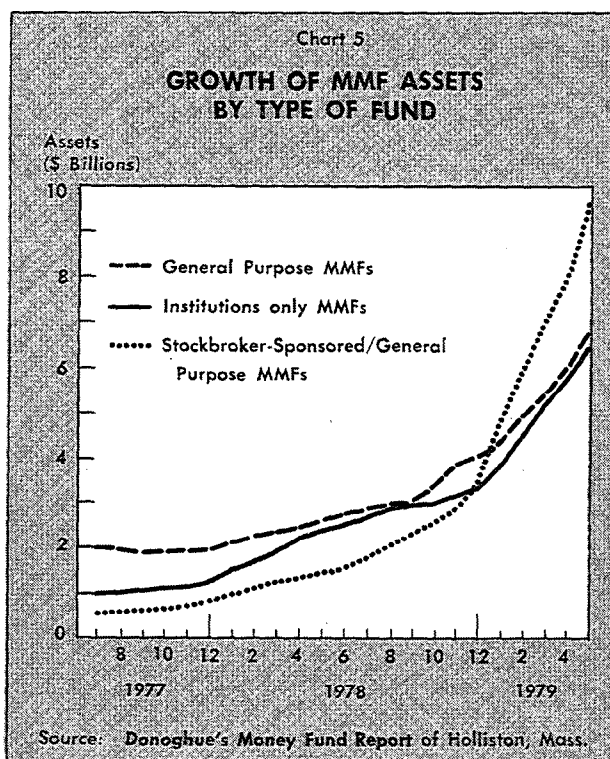
that 46 percent of the dollar volume of MMF shares was held by individuals and 54 percent was held by institutions (the rapid growth of the stockbroker-sponsored MMFs in 1979 has probably increased the percent of shares held by individuals). It seems likely that at least half and probably as much as three-quarters of the total MMF shares held by institutions at the end of 1978 were held by bank trust departments.[20]

With regard to investment in MMFs by individuals, it is impossible to estimate how much is coming from individuals seeking access to the money market and how much is from individuals who already had this access but who are nevertheless attracted to MMFs for other reasons. It appears, however, that a significant amount of money from this source is coming from individuals who are not using MMFs primarily to gain access to money market yields. Three pieces of information support this conclusion. The first is the rapid growth of the stockbroker-sponsored MMFs, which by May 1979 had combined assets of roughly $10 billion. Most of the money in these MMFs comes from individuals through brokers.[21] It seems unlikely that a large part of the growth of these MMFs is due to money being withdrawn by small investors from deposit institutions. Rather it appears that most of the growth in this group of MMFs has resulted from larger investors taking advantage of the opportunity offered by MMFs as an investment vehicle for funds freed by the sale of market securities.

The second piece of information on individual use of MMFs is data on MMF shares purchased and redeemed due to exchanges with other types of mutual funds in a fund group. These data suggest extensive use of MMFs by individuals for this purpose. Monthly purchases of MMF shares with money redeemed from other funds averaged $178 million a month in the year ending April 1979, and redemptions of MMFs for the purpose of buying shares of other mutual funds in a fund group averaged $135 million per month over the same period.

From January 1978 through April 1979 the difference between total MMF share sales due to exchanges and total MMF redemptions due to exchanges was $619 million.[22] This figure is an estimate of the growth of MMFs due to exchanges with other mutual funds.

Lastly, information on individual participation in MMFs comes from the Investment Company Institute survey cited above. This survey gathered data on average account size for individuals and institutions. The average account size for individual investors of the 30 MMFs (representing 43.5% of total MMF assets) which provided detailed data for the survey was $11,905.[23] Since this figure is above the $10,000 minimum required for purchases of Treasury bills and money market certificates, it implies that many individual MMF shareholders have these investment alternatives. Of course, the average is low enough to indicate that there are many individuals with accounts smaller than $10,000 for whom MMFs do provide the only access to money market yields.

Before concluding this section, it should be noted that one basic question has not been raised. If, as the evidence indicates, MMFs are not only a reaction to government regulations but also represent a new form of specialization in the financial markets, what economic explanation accounts for the timing of this new form of specialization? That is, why did MMFs spring up in the 1970's when mutual funds for stocks and bonds started decades earlier? A thorough answer to that question is beyond the scope of this paper. However, one possible explanation is that because MMFs have many more shareholder transactions than do mutual funds for stocks or bonds, they were not economically feasible prior to advances in computer technology in the late 1960's and 1970's that reduced the administrative and recordkeeping expenses associated with these transactions.

IV. CONCLUSION: THE FUTURE OF MMFs

The central conclusion of this paper is that the rapid growth of MMFs in 1978 and 1979 has been both a reaction to government regulations and a result of fundamental changes in the way some institutional and individual investors manage their short-

[20] This estimate is based on conversations with MMF officials. The Investment Company Institute survey estimates that at the end of 1978 51.8 percent of institutional shares were held by "total fiduciary accounts." This figure probably understates the trust department percentage because the survey also estimates that 20.7 percent of institutional shares were held by "other institutional accounts" and 7.6 percent were held by "total employee plans." Both of these categories probably include some funds handled by bank trust departments.

[21] Tyson [11] reports that 98 percent of the shareholders of the largest MMF (with assets of over $4 billion in June 1979) were already customers of the brokerage firm that operates the fund.

[22] These figures were provided by the Investment Company Institute.

[23] The average account size for institutions of the 30 MMFs that provided detailed data was $34,904. However, as noted in footnote 1, this figure is difficult to interpret because of the difference in the way these accounts are treated by different MMFs.

term financial assets. A corollary of this conclusion is that MMFs will survive as a new intermediary in the financial markets regardless of the future course of government regulations that have contributed to their growth in the past. While the future growth of MMFs can not be predicted with any certainty, some limited comments can be made regarding the three major categories of investors discussed in the paper.

Individuals Regulation Q ceiling rates on savings and short-term time deposits less than $10,000 have been a major factor underlying the participation of individuals in MMFs. As long as MMFs offer small savers the only means of gaining access to money market yields, the use of MMFs by individuals and, hence, the level of MMF assets will be sensitive to the differential between money market rates and Regulation Q ceiling rates. Much of the growth of individual participation in MMFs, however, is attributable to factors other than the limited access of small savers. Individuals with $10,000 or more to invest find MMFs attractive because of the advantages they offer as a financial intermediary: diversification, liquidity, possibly higher net yield, etc. Moreover, the growth of the stockbroker-sponsored MMFs suggests that MMFs are attractive to the individual investor as a repository for money available after a sale of stocks, bonds, or other financial assets. The exchange privilege offered by many MMFs in mutual fund groups is a further, but less important, reason why use of MMFs by individuals should continue regardless of the future of Regulation Q.

Bank Trust Departments The flow of funds into MMFs from bank trust departments is primarily a basic change in the way small- and medium-sized

trust departments manage their short-term assets. A rough estimate of the amount of funds potentially available to MMFs from this source is derived in Table IV. The information used in deriving this estimate consists of (1) the fraction of short-term to total assets of bank trust departments and (2) the fractions of short-term funds in different size bank trust departments potentially available to MMFs.

The first fraction is estimated largely on the basis of the ratio of STIF assets to total assets for the national trust departments that reported STIFs in the common trust fund survey discussed in Section I.[24] This ratio, .067, probably understates the true ratio of short-term to total trust department assets because money from agency accounts of personal trusts and estates cannot be put into STIFs. Consequently, the estimate used in Table II is set slightly higher. The increase in the estimate is based on the ratio of assets of agency accounts of personal trusts and estates to total trust department assets. For each size category of bank trust department, the portion of short-term funds potentially available to MMFs is based primarily on the frequency of STIF usage by trust department size shown in Table I. The assumption is that money in, or likely to end up in, STIFs is not potentially available to MMFs.

Column (5) in Table IV gives the estimate of total short-term funds potentially available for MMFs from each trust department size category. The total

[24] It would be more desirable to calculate the ratio of short-term assets to total assets directly. Data on trust assets are collected in the annual survey, **Trust Assets of Insured Commercial Banks** [5]. The data, however, are not collected in a manner that permits the division of short-term and long-term assets.

Table IV

A ROUGH ESTIMATE OF BANK TRUST DEPARTMENT SHORT-TERM FUNDS AVAILABLE TO MMFs

	Bank Trust Department Assets ($ millions) (1)	Estimate of Ratio of Short-Term to Total Assets (2)	Estimate of Total Short-Term Assets ($ millions) (3) = (1) X (2)	Estimate of Fraction of Short-Term Assets Available to MMFs (4)	Estimate of Total Short-Term Assets Available to MMFs ($ millions) (5) = (3) X (4)
Less than $100 million	5,546	.08	444	1.0	444
$10-25 million	7,555	.08	604	1.0	604
$25-100 million	26,535	.08	2,123	1.0	2,123
$100-500 million	59,242	.08	4,739	0.8	3,791
$500 million-1 billion	38,128	.08	3,050	0.5	1,525
More than $1 billion	365,709	.08	29,257	0.2	5,851
TOTAL	502,715		40,217		14,338

Note: The derivation of the estimate in column (2) is described in the text. Estimates in column (4) are based on Table I.

Source: Comptroller of the Currency, Federal Deposit Insurance Corporation, and Board of Governors of the Federal Reserve System, **Trust Assets of Insured Commercial Banks - 1977.**

estimate is $14.3 billion. Of course, this is only a rough estimate. (Also, the estimate, which is based on trust assets at the end of 1977, would be expected to grow slowly as trust assets increase.) Nevertheless, the estimate makes the point that the flow of bank trust department money into MMFs will probably not continue at the rapid pace of 1978-79. A reasonable judgment is that as of mid-1979 at least half of the trust department money potentially available to MMFs was already in these funds.

One caveat should be added. The survey of *Trust Assets of Insured Commercial Banks,* from which the total assets figures in column (1) of Table IV are taken, omits strictly custodial agency accounts and corporate trusts and corporate agency accounts. Strictly custodial agency accounts are those for which the trust department neither exercises investment discretion nor provides investment advice.[25] Corporate trusts and corporate agency accounts are created by a corporation to secure bond issues and for other purposes. No data are available on the magnitude of these two items.

Corporations Nonfinancial corporations have used MMFs only to a fairly limited degree. MMF share turnover rate data strongly suggest that MMFs have not been used extensively by corporate investors for transactions purposes. The unwillingness of MMFs to bear the costs of rapid share turnover is the most plausible explanation for this low turnover. One possibility is that pricing systems will evolve in the MMF industry that allocate the costs of rapid share turnover to investors using MMFs for transactions purposes. If so, the reluctance of MMFs to tolerate rapid turnover would diminish, and corporate use of MMFs as a partial substitute for demand deposit balances and as an alternative to RPs might increase.

To date, most of the limited use of MMFs by corporations have been due to smaller corporations which invest in MMFs rather than investing directly

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[25] There are three types of agency accounts: (1) **strictly custodial accounts** for which the trust department provides no investment advice and exercises no investment discretion; (2) **advisory agency accounts,** for which the bank trustee offers investment advice; and (3) **managing agency accounts,** for which the bank has investment discretion. Strictly custodial accounts are omitted from the survey of **Trust Assets of Insured Commercial Banks** because trust departments have no influence over the investment of the funds in these accounts.

in the money market. This decision is primarily based on which investment alternative offers the highest yield net of expenses consistent with the desired degree of liquidity and diversification. An analysis of the costs involved in running corporate money market investment programs was beyond the scope of this paper. If, however, MMFs are able to offer a higher net yield than some corporations can gain through investing directly in the money market, then it is likely that corporate use of MMFs will grow in the future.

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AVERAGE COSTS OF
MONEY MARKET MUTUAL FUNDS

Timothy Q. Cook and Jeremy G. Duffield

This article presents a discussion and analysis of the expenses of money market mutual funds (MMFs). The primary motivation of the study is to consider a possible explanation for the extensive use of MMFs by bank trust departments. A bank trust department has at least three options in managing the short-term funds of its separate accounts. First, it can invest the short-term funds of each account individually in time and savings deposits and, if the account has sufficient funds, money market instruments. Second, the trust department can operate a collective investment fund for money market instruments called a "short-term investment fund (STIF)." Under this arrangement, short-term funds of various accounts managed by the trust department are pooled and invested collectively. As a third alternative the trust department can place the short-term funds of its accounts in a MMF. With some minor differences, STIFs and MMFs provide the same services to the accounts of the bank trust department. In particular, both types of funds serve as financial intermediaries for short-term funds, thereby enabling investors to earn prevailing market rates of return on large money market instruments.

The decision to establish a STIF appears to be largely dependent on the size of the bank trust department. The larger the trust department, the more likely it is to have a STIF. Survey data presented in the accompanying article [5] demonstrate this relationship convincingly. Of the trust departments in the survey with assets of $100 million or less, fewer than 1 percent had established STIFs and of the trust departments with assets of $100 million to $500 million, only about 10 percent had STIFs. In contrast, almost 40 percent of the trust departments in the survey with assets of $500 million to $1 billion had STIFs and about 65 percent of the departments with assets of $1 billion or more had STIFs.

Many, if not most, bank trust departments without STIFs use MMFs. A possible explanation for the use of MMFs by small- and medium-sized bank trust departments is that both MMFs and STIFs are subject to decreasing average costs as assets increase. If so, a small- or medium-sized bank trust department could get a higher yield *net* of expenses for its

accounts by investing in a MMF than by setting up a relatively small STIF. In order to evaluate this explanation using MMF expense data, the argument is made in this paper that MMFs and STIFs are subject to most of the same expenses and that the behavior of the relevant MMF expenses with respect to asset size can be used as a proxy for the behavior of STIF expenses.

A second motivation of the paper is to provide additional evidence on the question of the existence of economies of scale in the operation of financial intermediaries.[1] Economies of scale are present when the long-run operating costs per unit of output of a business fall as output increases. MMFs provide a unique opportunity to investigate economies of scale of financial institutions because the "output" or "product" of MMFs is more homogeneous than the output of other financial intermediaries such as commercial banks. For the purpose of this paper MMFs are assumed to produce one output: the service of intermediation in the investment of short-term funds.[2] That output is measured in the paper by the dollar volume of funds for which the MMF is serving as an intermediary.

I. TYPES OF MONEY MARKET FUND EXPENSES

To investigate the two issues raised above, expense data were gathered from the annual reports and prospectuses of 40 money market funds.[3] The general format under which expense data are reported

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[1] For a summary and discussion of previous evidence with regard to economies of scale of financial intermediaries, see Benston [2].

[2] Of course, there are some minor variations across MMFs in the nature of services provided to shareowners. For example, most, but not all, offer checking privileges and the share redemption policies of some funds are more sophisticated than others. In general these differences were too difficult to identify and quantify and, in any case, were thought to have a negligible effect on expenses. In one instance discussed later in the article an attempt was made to capture variations in the extent of a service provided.

[3] Initially, the prospectuses and annual reports of 57 money market funds were collected. In order to avoid the possibility of including startup or organizational expenses in the data, no fund was included in the study if the beginning of the expense period reported was also the starting date of the fund. This criterion eliminated

by MMFs is fairly standard. This format is illustrated in Table I, which presents expense data reported by one of the MMFs. In the table expenses are grouped into two broad categories and seven subcategories, consolidating 35 different items reported by one or more of the MMFs. The grouping by items is listed in the Exhibit at the end of the article.

The two broad expense categories shown in Table I are operating and nonoperating expenses. (This classification is made for the purposes of this paper and is not found in MMF reports.) Operating expenses include all expenses incurred by the MMF in its operations as an intermediary for short-term funds. In this role it pools money from various investors and invests that money in short-term money market instruments. The expenses considered here to be operating expenses of the MMF are all expenses related to management and administration of the fund, the selection and storage of securities, and transactions and communications with shareowners. Nonoperating expenses are those expenses not incurred in the MMF's operation as a financial intermediary. The expenses included in this second category are either government expenses, such as registration fees and taxes, or expenses resulting from government regulations and requirements, such as auditing expenses.

The division of total expenses into operating and nonoperating expenses is necessary to investigate the issues raised above. First, by definition, the presence of economies of scale depends on the behavior of operating costs. Consequently, it is necessary to measure and analyze these costs separately. Second, in order to use MMF expenses as a proxy for STIF expenses, it is necessary to identify which MMF expenses are incurred by STIFs. Since STIFs and MMFs fulfill the same function, they should have similar operating expenses. Hence, the behavior of this category of expenses is of particular interest. A third reason for making the division between oper-

ating and nonoperating expenses is that since, as will be shown later, the two categories of expenses behave quite differently as MMF asset size increases, examining them separately aids in an understanding of the behavior of total MMF expenses.

The largest operating expense is "management and advisory fees." Under the organizational structure common to virtually all MMFs, the fund is run by an "administrator" or an "advisor" who provides certain services to the MMF for a fee, which is specified as a percent of the total assets of the fund. While there is some variation in the services covered by the fee, these services usually include: (1) administration and management of the fund and (2) investment advice and portfolio selection. In most cases the administrator provides both these services, although in some instances the investment advisory service is delegated to a second organization which is paid part of the management and advisory fees. The annual management and advisory fees, reported by all 40 funds, ranged from .32 percent to .625 percent of average assets, with 29 of the firms reporting fees equal to .50 percent of assets.[4] The management and advisory fees may also cover other services in addition to the two noted above. Because the services covered by the management and advisory fees vary across funds, the ratio of management and advisory fees to total operating expenses also varies considerably.

The second operating expense category shown in Table I is reports to shareowners, which covers expenses related to the production and mailing of shareowner reports.[5] (In some cases nothing is reported under this category, because these expenses are covered by the management and advisory fees.) The third operating expense category, other operating expenses, covers a number of items. The two major and most commonly reported items are expenses related to transactions with shareowners, including the distribution of dividends, and custodial expenses related to the storage and safekeeping of securities. Two of the 40 MMFs charge shareowners a direct

Table I

STANDARD EXPENSE REPORTING FORM OF MONEY MARKET MUTUAL FUNDS

	Account (thousands)	Percent of Average Assets
Operating Expenses	$202.7	.80
Management and Advisory Fees	127.6	.50
Reports to Stockholders	25.1	.10
Other Operating Expenses	50.0	.20
Other Expenses	105.1	.41
Professional Fees	40.5	.16
Directors' Fees	15.0	.06
Registration Fees, Taxes, Amortization	35.3	.14
Miscellaneous	14.3	.05
Total Expenses	307.8	1.21
Less Expenses "Waived" by Administrator	53.3	.21
Expenses Absorbed by Shareholders	254.5	1.00

monthly service fee. In this paper those fees are included in other operating expenses.

The second broad category of expenses includes all nonoperating expenses of the MMF. The first group of nonoperating expenses, professional expenses, covers auditing and legal expenses. The second, directors' (or trustees') fees, is self-explanatory. A third group of nonoperating expenses includes state and local taxes, state and SEC registration fees, and amortization expenses. Amortization expenses, which were reported by 14 of the 40 MMFs, were the most difficult item to categorize. Since several of those MMFs stated that part of the amortization expenses were related to initial SEC registration expenses, it was decided to include this item with taxes and registration fees. The last grouping is for miscellaneous expenses.

After calculation of total expenses, the administrators of 23 out of 40 MMFs "waived" or "reimbursed" to the fund part of these expenses. That is, part of total expenses were not absorbed by shareowners of the fund. In some cases the waiver was part of an explicit commitment by the MMF's administrator to place a limit on the expenses of the fund absorbed by shareholders. In the example shown in Table I, for instance, the administrator placed a limit on total annual expenses absorbed by shareowners equal to 1.00 percent of the fund's average assets. In other cases the waiver is an informal management arrangement not described explicitly in the prospectus or annual report. In reports to stockholders the waiver is often couched in terms of

the administrator "foregoing" part of the advisory and management fees. In some instances the administrator has not only foregone all of the advisory and management fees but also absorbed other expenses of the fund. An important assumption made at this point is that the true measure of total costs of the fund is total expenses *before* the waiver. This assumption will be discussed in more detail later.

Table II lists the expenses in each of the categories described above for the 40 MMFs. The MMFs are arranged in Table II by average asset size. The table also lists the expense waivers and indicates the percent of total expenses covered by the waiver. The "share turnover rate," shown in the last column of the table, is the rate at which the MMF's shares turned over in the period for which its expenses are shown. It is measured as total redemptions of shares divided by the average dollar volume of shares outstanding. Total expenses as a percent of average assets of the 40 MMFs are graphed in Chart 1.

II. THE REGRESSION MODEL

This section specifies a regression model relating MMF costs to three other MMF variables. These three variables are (1) assets, (2) average account size, and (3) share turnover rate.

Assets The first variable related to costs is the size of the MMF, as measured by average MMF assets over the period for which expenses are mea-

Chart 1

AVERAGE COSTS OF MONEY MARKET MUTUAL FUNDS

Note: (1) Average costs are measured as the percent of total expenses to average assets over the period for which expenses are reported. (2) Assets scale changes at $100 million.

Source: Annual reports and prospectuses of the various money market funds.

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II. THE REGRESSION MODEL

This section specifies a regression model relating MMF costs to three other MMF variables. These three variables are (1) assets, (2) average account size, and (3) share turnover rate.

Assets The first variable related to costs is the size of the MMF, as measured by average MMF assets over the period for which expenses are mea-

Chart 1

AVERAGE COSTS OF MONEY MARKET MUTUAL FUNDS

Note: (1) Average costs are measured as the percent of total expenses to average assets over the period for which expenses are reported. (2) Assets scale changes at $100 million.

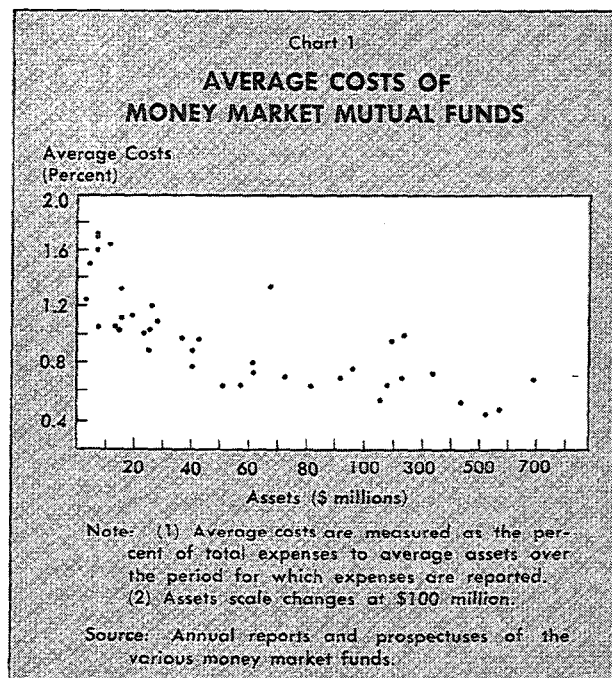Source: Annual reports and prospectuses of the various money market funds.

Table II

EXPENSES AND ASSETS OF MONEY MARKET MUTUAL FUNDS

($ thousands)

	Average Assets	Management and Advisory Fees	Reports to Share-owners	Other Operating Expenses	Profes-sional Expenses	Directors' Fees	Taxes, Registra-tion Fees, and Amor-tization	Miscel-laneous	Total Expenses	Waiver or Reim-bursement	Percent of Total Expenses	Share Turn-over Rate
1.	2,325	11.6	2.0	4.7	1.5	2.0	7.0	0.2	29.0	5.6	19.1	1.7
2.	3,911	24.2	4.1	2.4	9.8	—	17.0	1.1	58.5	19.4	33.2	3.1
3.	6,358	32.1	4.0	22.5	16.3	—	30.5	3.4	108.8	45.2	41.6	1.7
4.	6,474	32.4	5.4	8.7	7.7	0.7	6.6	7.5	68.9	26.8	38.9	2.5
5.	6,556	32.8	12.9	6.8	26.9	3.8	13.4	1.4	97.9	5.5	5.6	0.5
6.	6,762	33.9	11.0	33.9	19.9	4.1	—	11.6	114.4	33.9	29.6	2.1
7.	10,165	50.8	5.4	98.0	3.5	4.6	—	6.9	169.2	32.7	19.3	2.8
8.	12,647	63.2	2.7	50.4	13.6	—	3.4	0.4	133.7	112.0	83.8	7.8
9.	14,031	70.4	13.0	14.0	15.8	13.5	17.2	1.2	145.0	39.8	27.4	28.7
10.	14,436	72.2	21.5	25.7	18.1	3.9	15.8	4.5	161.7	89.6	55.4	2.2
11.	15,024	54.8	20.4	38.2	30.8	12.6	26.2	16.1	199.0	49.2	24.7	1.8
12.	18,443	92.2	11.9	46.5	29.0	4.2	14.7	12.5	211.0	72.7	34.4	1.4
13.	22,563	112.7	8.1	63.3	8.5	—	31.4	8.4	232.4	—	—	6.6
14.	24,294	121.5	15.1	28.3	16.0	9.2	18.5	7.5	216.1	116.5	53.9	2.8
15.	24,369	121.8	—	60.7	22.8	1.5	40.1	7.3	254.3	39.8	15.7	6.4
16.	25,451	127.6	25.0	50.0	40.5	15.0	35.3	14.3	307.8	53.3	17.3	3.6
17.	27,107	135.8	11.0	46.3	23.0	17.0	38.0	24.5	295.5	—	—	4.8
18.	35,707	178.6	4.6	84.5	38.9	8.1	27.5	9.5	351.8	33.5	9.5	7.7
19.	38,337	191.7	8.7	29.0	33.0	5.5	64.4	9.1	341.5	92.3	27.0	4.1
20.	39,539	196.7	14.0	24.5	23.0	2.5	40.3	7.4	308.4	155.9	50.6	2.5
21.	41,776	209.8	14.3	46.3	52.2	16.0	52.9	12.4	403.8	86.3	21.4	3.8
22.	49,876	199.7	18.2	23.6	26.8	2.5	48.0	0.4	319.2	—	—	3.3
23.	51,036	256.1	—	75.6	—	—	—	—	331.7	—	—	9.7
24.	59,919	300.3	—	107.7	55.3	6.4	2.1	13.6	485.3	—	—	2.7
25.	60,405	300.0	16.0	—	14.0	9.0	108.0	—	447.0	—	—	2.8
26.	66,580	333.9	78.0	413.9	12.0	14.4	41.2	—	893.4	74.5	8.3	8.0
27.	71,342	321.6	46.0	60.2	16.6	11.0	43.9	7.2	506.5	—	—	2.1
28.	80,636	302.5	9.1	42.6	39.5	44.9	63.1	11.0	512.8	45.1	8.8	3.8
29.	90,992	364.7	9.6	52.1	64.0	24.0	100.1	22.5	637.0	—	—	4.7
30.	95,488	479.1	41.0	64.1	30.9	14.1	93.4	3.0	725.7	—	—	3.9
31.	144,447	504.4	—	38.3	48.3	32.0	141.0	16.0	780.0	—	—	5.8
32.	170,224	685.1	—	97.5	189.1	16.2	89.7	28.7	1,106.5	—	—	4.1
33.	188,958	942.8	78.2	386.2	43.6	20.2	272.3	51.8	1,795.1	—	—	3.1
34.	221,348	1,109.9	29.0	169.7	42.8	11.5	94.5	92.0	1,549.4	—	—	2.1
35.	229,380	1,146.7	82.5	897.5	78.5	13.0	85.6	—	2,303.8	10.0	0.4	3.8
36.	328,705	1,578.5	32.0	197.6	57.3	14.9	519.3	—	2,399.6	—	—	3.7
37.	429,072	1,275.3	13.5	559.8	60.3	18.3	211.8	31.1	2,170.1	—	—	3.0
38.	508,887	1,645.0	24.8	261.7	122.5	66.5	58.1	9.5	2,188.2	—	—	2.5
39.	557,390	2,229.5	6.4	234.6	83.7	14.0	11.1	30.1	2,609.4	101.2	3.9	3.2
40.	681,582	3,403.5	64.7	780.4	60.5	26.5	264.1	35.0	4,634.8	—	—	2.3

sured. Many, if not most, MMF expenses are primarily a function of the size of the MMF portfolio. These expenses include the management and advisory fee and expenses related to security transactions and storage. As noted earlier, the key area of interest in the study is the relationship between expenses and assets as assets rise.

Average account size While the preponderance of MMF expenses are related to the size of the portfolio, others appear to be related to the number of shareholder accounts. Examples of such expenses

are reports to shareholders and transactions with shareholders. The variable used to capture the impact of these expenses on costs is average account size. If two funds have an equal amount of assets, it is postulated that the one with higher average account size will have lower costs.[6]

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[6] Alternatively, the number of accounts could be used instead of average account size. Average account size was chosen because the number of accounts is closely correlated with asset size, which is already in the regression.

Share turnover rate Other things equal, one would expect administrative and shareholder servicing costs of a MMF to vary positively with the share turnover rate of its shares. In general the higher the share turnover rate of a given fund, the more the shareowners of that fund are using their shares for transactions purposes. As argued in the second article in this *Review*, the relatively low share turnover rates of MMFs indicate that MMF shares are more comparable to savings than to demand deposits. Nevertheless, to the extent that turnover rates do vary across MMFs, one would expect administrative and shareholder costs to vary accordingly.

In order to estimate the relationship between MMF expenses and MMF asset size, average account size, and share turnover rate, the following equation was specified:

$$(1) \quad C = aA^b AAS^c TR^d,$$

where C is total costs, A assets, AAS average account size, and TR share turnover rate. Equation (1), which is the specification most commonly used in cost studies of financial institutions, has the feature that the coefficient "b" is the elasticity of expenses with respect to asset size. If b is less than 1, a given percentage change in assets will result in a smaller percentage change in total costs.

Prior to the estimation of equation (1), both sides were divided by A, so that the dependent variable is average costs, the same measure shown in Chart 1:

$$(2) \quad C/A = aA^{b-1} AAS^c TR^d.$$

Equation (2) is nonlinear and, as such, cannot be estimated using ordinary least squares. In order to estimate the equation using ordinary least squares,

it is necessary to transform it into linear form by expressing the variables as logarithms. Accordingly, natural logarithms of both sides of (2) were taken:

$$(3) \quad \log(C/A) = \log(a) + (b-1)\log(A) + c\log(AAS) + d\log(TR).$$

In this equation the coefficient of log (A) is (b—1). Hence, the standard test of the hypothesis that (b—1) is significantly different from 0 is equivalent to the test of whether b is significantly different from 1.

III. REGRESSION RESULTS

Table III reports regression results with four different measures of expenses as the dependent variable.[7] Because average account size data for 3 of the 40 MMFs were not available, these funds were eliminated from the sample in the regressions reported in the table. Also in none of the regression results did the share turnover rate enter the equation with a significant coefficient. Consequently, the reported equations do not include that variable.

The first equation reported in Table III is for total average expenses (C/A). The regression results support the hypothesis that money market funds are subject to decreasing average costs as asset size increases. The estimate of (b—1) is —.183 and is

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[7] All data except the average account size were gathered from individual MMF stockholder reports. The average account size data were calculated using individual company asset size and shareholder accounts data from Donoghue [6]. These data were not available for three of the funds (1, 12, 24). For the other funds average account size was calculated for each month. These monthly figures were then averaged over the period for which each fund's expense data were used.

Table III

REGRESSION RESULTS: ALL MMFs

Dependent Variable	Constant	log (A)	log (AAS)	SE	$\overline{R}^2$	Elasticity of Costs With Respect to Assets
(1) log (C/A)	−2.436 (10.82)	−.183 (8.22)	−.092 (3.92)	.175	.770	.817
(2) log (OC/A)	−3.527 (13.15)	−.101 (3.81)	−.119 (4.26)	.208	.584	.899
(3) log (NOC/A)	−1.441 (2.51)	−.442 (8.37)		.445	.664	.558
(4) log (POC/A)	−2.963 (11.82)	−.146 (5.91)	−.108 (4.12)	.194	.690	.854

Note: All variables are measured in thousands of dollars. Equation 1 has 37 observations. Equations 2, 3, and 4 have 36 observations. C = total costs, OC = operating costs, NOC = nonoperating costs, POC = professional fees plus operating costs, A = average assets, AAS = average account size. Figures in parentheses are t-statistics.
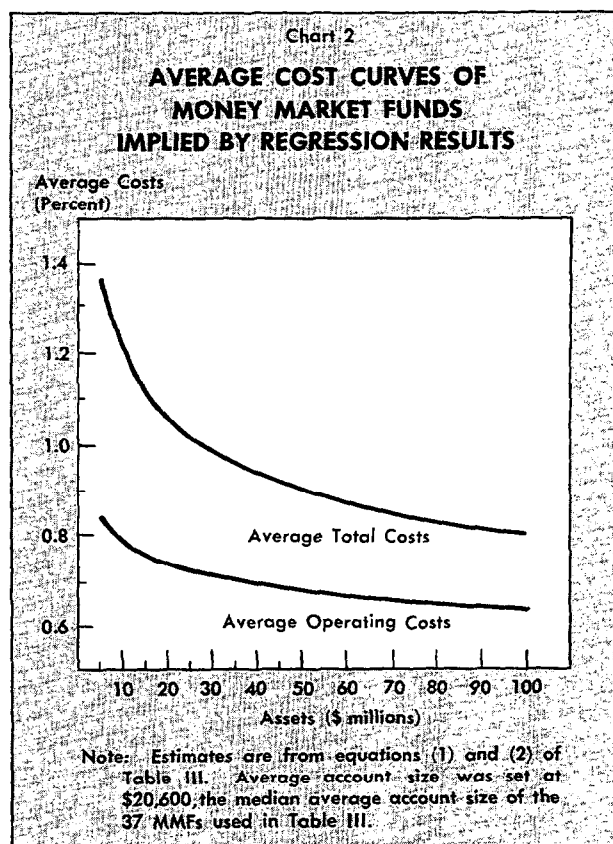
highly significant. The implied estimate of the elasticity of expenses with respect to assets, .817, is shown on the right-hand side of the table. The coefficient of the average account size variable also has the expected sign and is highly significant.

The remaining regressions reported in Table I relate to the issues raised at the beginning of this article. One of these issues was whether MMFs experience economies of scale. Equations (2) and (3) in Table III break down total average expenses into average operating costs (OC/A) and average nonoperating costs (NOC/A), respectively.[8] The coefficient of assets in equation (2) is significantly less than 0 at the 1 percent level. The implied elasticity of operating costs with respect to assets is .899. Since this elasticity is less than 1, these results support the view that MMFs experience economies of scale in their operations as a financial intermediary for short-term funds.

Equation (3) in Table III reports the regression results for average nonoperating costs. The coefficient of log (A) is again highly significant. The implied elasticity of nonoperating expenses with respect to assets is .558. As would be expected, there is not a statistically significant relationship between average account size and nonoperating costs. The regression results in equation (3) indicate that the impact of unit nonoperating costs on total average costs drops sharply as asset size increases. This phenomenon is illustrated in Chart 2 which shows the average MMF total cost curve and the average operating cost curve implied by the regression results. The difference between the two curves represents average nonoperating costs. At low asset levels average nonoperating costs are a substantial part of total average MMF costs. As asset size increases, however, average nonoperating costs drop sharply. In contrast, the decline in average operating costs is much more gradual.[9]

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[8] Fund 23 is excluded from the sample used in regressions (2), (3), and (4) in Table III because expenses of that fund were not reported in a way that they could be divided into the expense categories used in these regressions.

[9] Two aspects of the regression results should be mentioned at this point. First, Benston [2] has suggested that running the regression with log (C/A) biases the coefficient of log (A) because A is in the denominator of the dependent variable. To test for this possibility the regressions were rerun using log (C) as the dependent variable. The resulting estimates of the elasticities of cost with respect to assets were virtually unchanged, as were the coefficients of the average account size variable. Second, three of the funds used in the regressions have average account sizes much larger than the other funds. The reason for this is that in reporting the number of accounts these MMFs treat all the accounts of a bank trust department as one account. To see if these funds were having an impact on the regression

Chart 2
AVERAGE COST CURVES OF MONEY MARKET FUNDS IMPLIED BY REGRESSION RESULTS

Average Costs (Percent)

Average Total Costs

Average Operating Costs

Assets ($ millions)

Note: Estimates are from equations (1) and (2) of Table III. Average account size was set at $20,600, the median average account size of the 37 MMFs used in Table III.

Bank Trust Department Behavior The major question raised at the beginning of this article was whether an examination of the expenses of MMFs could help explain the extensive usage of MMFs by small- and medium-sized bank trust departments. It was speculated that these bank trust departments might use MMFs to take advantage of the lower average expenses experienced by a larger intermediary for short-term funds. The regression results in Table III indicate that MMFs experience both declining operating costs and nonoperating costs in the management of short-term funds. If the cost behavior of MMFs is used as a proxy for the cost behavior of STIFs, these results explain why large bank trust departments set up STIFs, while smaller bank trust departments use MMFs.[10]

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results in Table III, the regressions were rerun without the data for these funds (28, 31, 38). The only effect was to raise the absolute value of the average account size coefficient. The t-statistics of all coefficients were little changed.

[10] It would be better to deal with the issue directly by analyzing the cost data of STIFs. However, these data would be extremely difficult to gather. More importantly, the data would be impossible to analyze because some STIF expenses are charged directly to the STIF while other expenses are charged to the bank trust department.

Is it reasonable to use the cost behavior of MMFs as a proxy for the cost behavior of STIFs? Since both STIFs and MMFs fulfill the same function—the intermediation of short-term funds—it seems quite reasonable to assume that the operating expenses of STIFs are similar to those of MMFs and exhibit the same behavior as MMF expenses with respect to asset size. True, STIFs do not have expenses related to transactions with shareholders, but they do have expenses related to transactions between the STIF and individual accounts of the bank trust department. In addition, STIFs are required to publish an annual report and a "plan" similar to a prospectus.

It is not clear to what extent the nonoperating costs of MMFs—professional fees, registration fees and taxes, and directors' fees—are incurred by STIFs. One exception is auditing expenses, which are clearly incurred by STIFs since, like MMFs, they are required to have an annual audit.[11] If it is assumed that STIFs are not subject to the other nonoperating expenses of MMFs, then the appropriate aggregate MMF expense category to use as a proxy for aggregate STIF expenses is operating costs plus professional fees. A regression with average operating plus average professional costs (POC/A) as the dependent variable is shown as equation (4) in Table III. The estimate of the elasticity of costs with respect to assets is .854, again indicating declining average costs with respect to asset size.

MMFs of $50 Million or Greater As shown in Chart 1, while the negative relationship between average MMF costs and asset size appears quite strong at low asset levels, the relationship seems

much weaker at high asset levels. A final question addressed in this section is whether MMFs are subject to decreasing average total costs and decreasing average operating costs at high asset levels. In an attempt to answer this question, the regressions in Table III were rerun with data for only those MMFs with assets of $50 million or greater.

The regression results for MMFs with $50 million or greater of assets are shown in Table IV. The coefficients of the average account size variable are significant and very close to those in Table III. The coefficient of the asset size variable is significant at the 10 percent level in the average total costs regression (1) and significant at the 1 percent level in the average nonoperating costs regression (3). In equations (2) and (4) which have average operating expenses and average operating plus professional expenses, respectively, as the dependent variables, the average asset size coefficient is not significantly different from zero, even at the 20 percent level. Consequently, the results in Table IV provide some evidence that average total MMF costs are negatively related to asset size even after $50 million. They provide minimal support for the presence of decreasing average operating costs (economies of scale) among MMFs with assets greater than $50 million. In light of the limited number of observations used in the regressions, the results should be viewed as tentative.[12]

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[11] See [4].

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[12] There was very rapid growth in the MMF industry following the period over which the data for this article were collected. As a result, as of mid-1979 there were many more MMFs with assets of $50 million or greater. Consequently, a follow-up study would have a larger sample of funds to use in considering the question of economies of scale of MMFs with assets of $50 million or more.

· Table IV

REGRESSION RESULTS: MMFs OF $50 MILLION OR GREATER

Dependent Variable	Constant	log (A)	log (AAS)	SE	$\bar{R}^2$	Elasticity of Costs With Respect to Assets
(1) log (C/A)	−3.263 (4.56)	−.116 (1.95)	−.087 (2.85)	.213	.386	.884
(2) log (OC/A)	−4.077 (4.38)	−.060 (.77)	−.108 (2.87)	.261	.310	.940
(3) log (NOC/A)	−.706 (.429)	−.503 (3.68)		.463	.440	.497
(4) log (POC/A)	−3.807 (4.45)	−.080 (1.12)	−.099 (2.86)	.240	.332	.920

Note: All variables are measured in thousands of dollars. Equation 1 has 18 observations. Equations 2, 3, and 4 have 17 observations. C = total costs, OC = operating costs, NOC = nonoperating costs, POC = professional fees plus operating costs, A = average assets, AAS = average account size. Figures in parentheses are t-statistics.

IV. THE EXPENSE WAIVER

As mentioned earlier, many MMF administrators "waived" part of the fund's total expenses in the reporting periods covered by this paper. That is, rather than passing on all of the MMF's expenses to the shareowners, the MMF's administrator absorbed some of these expenses. As a result expenses absorbed by shareowners were often less than total expenses. Throughout this article it has been assumed that the expense waiver is a waiver of true costs. The evidence strongly supports this interpretation.[13] Table II shows the waiver as a percent of total expenses. The table shows a clear division between MMFs with less than approximately $50 million of assets, and those with $50 million or more. Of the 21 MMFs with less than $50 million of assets, 19 had expense waivers and 13 had expense waivers of 20 percent or greater. Of the 19 MMFs with assets of $50 million or greater, only 4 had expense waivers and none had a waiver as high as 10 percent.

These data illustrate that the waiver is being used by the administrators of the small MMFs to enable them to compete more effectively with the large funds. To the extent that the approach is successful, a small MMF can grow to an asset level where average costs can be fully passed on to shareowners.

V. SUMMARY

This article has provided evidence that average costs of MMFs decline as assets increase, at least up to asset levels of about $50 million. This conclusion applies both to operating costs and nonoperating costs. It was argued that STIFs are subject to most of the same types of expenses as money market funds and that the behavior of MMF expenses could be used as a proxy for the behavior of STIF expenses. If so, then the results presented here offer an explanation for the large-scale use of MMFs by small- and medium-sized bank trust departments.

Lastly, it was shown that the amount of expenses waived by the administrators of MMFs is closely and inversely related to asset size. A reasonable interpretation of this relationship is that the waiver is a method whereby small MMFs can be competitive with larger funds until they reach an asset level where costs can be fully passed on to shareowners.

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[13] Actually, a special factor was responsible for the size of Fund No. 8's 83.8 percent waiver, which was easily the highest reported. This money market fund was being used as a "loss leader" to attract investors to other funds in its fund group. See Anreder [1].

References

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5. Cook, Timothy Q., and Duffield, Jeremy G. "Money Market Mutual Funds: A Reaction to Government Regulations or a Lasting Financial Innovation?" *Economic Review*, Federal Reserve Bank of Richmond (July/August 1979).

6. *Donoghue's Money Fund Report* of Holliston, Mass. Various issues.

Exhibit

MMF EXPENSE CATEGORIES

	Times Reported
I. Operating Expenses	
A. Management and Advisory Fees	40
B. Reports to Shareowners	
Reports to Shareowners	18
Printing/Printing and Postage	13
Postage	2
Postage, Supplies, Printing	7
C. Other Operating Expenses	
Shareowner Services	11
Transfer Agent	14
Custodian	25
Custodian and Shareowner Services	5
Custodian and Transfer Agent	7
Accounting Services	3
Bookkeeping	2
General and Administrative	4
General and Administrative and Shareowner Services	1
Office Salaries	2
Promotion	1
Telephone	2
Rent	2
Equipment Maintenance	1
Interest	1
Service Fees	2
Bank Transaction and Checking Fees	1
II. Nonoperating Expenses	
A. Professional Expenses	
Audit	23
Legal	23
Audit and Legal	11
Professional Fees	4
Audit and Accounting	1
Legal and Filing	1
B. Directors' and Trustees' Fees	
Directors' Fees	26
Trustees' Fees	9
C. Registration Fees, Taxes, Amortization	
State and Local Taxes	17
Registration Fees	34
Amortization	14
D. Miscellaneous	
Miscellaneous	35
Insurance	3