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BY

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MONEY MARKET MUTUAL FUNDS: AN EXPERIMENT IN AD HOC DEREGULATION

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The astounding growth of money market mutual funds (MMMFs) in the late 1970s and early 1980s, and their interaction with regulated financial institutions, has become a classic case study of the process of financial market innovation and consumer economic education. MMMFs grew from $2.4 billion in assets at the end of 1974 to $74.4 billion in assets at the end of 1980. In the first six months of 1981 they have incredibly doubled again in asset size (to $140 billion).

Money market mutual funds arose primarily because of deposit rate ceilings and other liability regulations which prevented the traditional financial intermediaries from offering the public a market rate and a highly liquid deposit-type account. The growth of MMMFs, however, was caused not merely by the availability of a more desirable financial instrument, but was actually accelerated by the piecemeal nature of the financial deregulation process. The introduction of the money market certificate (MMC) at commercial banks and thrift institutions appears to have greatly accelerated consumer interest rate sensitivity. The massive advertising campaign for money market certificates that accompanied the introduction of the MMCs not only led to a large growth in these account types but also led to an explosive spillover growth in money market mutual funds. Thus, the partial deregulation of deposit liabilities meant to alleviate the competition of MMMFs appears to have greatly accelerated their appeal to the consumer. In attempting to control the slow hemorrhaging of the regulated

financial institutions, the regulators (or deregulators as the case may may be) created a new highly pressured environment which has resulted in a massive leakage of funds from financial institutions. By only deregulating short-term liabilities of regulated financial institutions, the regulators, in essence, allowed most consumers to receive market interest rates only on short-term deposits. This piecemeal deregulation, in conjunction with an inverted yield curve, led to a surge in the supply of funds to the short end of the market. This shortening of the liability structure of financial institutions has substantially worsened the maturity mismatch of these financial institutions. This is especially true of thrift institutions whose ability to acquire assets other than long-term fixed rate mortgages was greatly restricted until recently. It is in this environment that we examine the growth of the MMMF.

The first portion of the paper presents an analysis of the growth of MMMFs and their importance to various segments of the financial market. It also examines the portfolio choices of MMMFs. Section II derives a theoretical model of household portfolio allocation to MMMFs, while section III specifies an empirical version of this model. Section IV presents our empirical results. Section V provides a summary and conclusions.

Section II: The Growth and Importance of MMMFs to Financial Markets

The extraordinary growth in MMMFs since 1977 can best be seen by examining Table 1 which shows the growth in assets of major depository institutions as well as MMMFs. The assets held by MMMFs have grown by a factor of 50 since the end of 1977 while most other depository institutions increased by a factor of .4 (or 40 percent) in this same period. This shift in investor behavior is even more dramatically illustrated by Table 2. Prior to 1978, net change in money market fund shares never amounted to more than 2 percent of net acquisition of financial assets by households. In the first quarter of 1981, however, MMMFs accounted for an astounding 60 percent of all households' net acquisition of financial assets. In stock terms, this means that MMMFs which never accounted for more than .4 percent of households' assets now account for nearly 6 percent of all assets held by the household (including investors) sector. (See Table 3.) This restructuring of investors' portfolios to MMMFs and away from financial institutions represents a clear response to what is perceived by the public to be a superior financial instrument. The consumer has thus deregulated the financial system despite the efforts of the federal government and the organized financial institutions to maintain deposit rate ceilings, and a below market pool of lendable funds.

The impact of this ad hoc deregulation on the sources and uses of credit in the economy has also been apparent. Table 4 indicates that MMMFs as a financial intermediary accounted for nearly 22 percent of funds advanced in credit markets in the first quarter of 1981. This makes

Table 1

Funds Advanced in Credit Markets by Money Market Funds as Percentage of Total Funds Advanced in Credit Markets (Flows)

	1974	1975	1976	1977	1978	1979	1980	May 1981	% Growth 1974-1980
Commercial Banks	794.9	825.9	890.7	988.7	1129.9	1252.1	1364.0	1395.[e]	71.59%
Savings & Loans	295.5	338.2	391.9	459.2	523.6	579.3	629.5	644.4	113.03
Mutual Savings Banks	110.3	122.2	136.4	149.5	161.2	163.3	172.6	172.8	56.48
Credit Unions	31.1	36.9	43.3	51.6	58.4	62.3	70.8	73.5	127.65
Money Market Funds	2.4	3.7	3.7	3.9	10.8	45.2	74.4	140.[e]	3000.00

Source: Federal Reserve Board, Flow of Funds Outstanding, May 1981

e = estimated

Table 2

Net Change in Money Market Fund Shares as Percentage of of Net Acquisition of Financial Assets by Households

1974	1.89
1975	.85
1976	-
1977	.09
1978	2.78
1979	13.53
1980	10.64
1981 - 1st quarter	60.55

Source: Derived from Federal Reserve Board, Flow of Funds Accounts, First Quarter 1981

Table 3

Money Market Shares as Percentage of Stock of Total Household Deposits*

Year	$ (Billions)	Percent of Total Household Deposits
1974	2.4	.28
1975	3.7	.39
1976	3.7	.35
977	3.9	.33
1978	10.8	.81
1979	45.2	3.11
1980	74.4	4.58
1981 (May)	140.[e]	5.77[e]

*Includes Demand Deposits, Savings and Time Deposits, Money Fund Shares.

Source: Derived from Federal Reserve Board, Flow of Funds Outstanding, May 1981

Table 4

Funds Advanced in Credit Markets by Money Market Funds As Percentage of Total Funds Advanced in Credit Markets (Flows)

1974	.35%
1975	.31
1976	.20
1977	-.03
1978	.66
1979	4.10
1980	3.43
1981 - 1st Quarter	21.52

Source: Derived from Federal Reserve Board, Flow of Funds Outstanding and Flow of Funds Accounts, First Quarter 1981

MMMFs a critical source of funds to potential borrowers. As of 1980, the MMMFs were the major purchaser of open market paper (57 percent of all commercial paper) and a prime acquirer of large bank time deposits (32 percent). As Tables 5 and 6 show, the MMMFs are thus recycling a large portion of their assets back to the commercial lending market, either directly through commercial paper, or indirectly through holding large C.D.s at commercial banks. It should also be noted that virtually none of the jumbo C.D.s or commercial paper held by MMMFs are invested in thrift institutions. Thus, MMMFs are to some extent selectively recycling credit away from the residential lending market.

In addition to the impact of MMMFs on credit flows, it is also useful to look in more detail at the portfolio distribution. As Table 7 shows, at the end of 1980 MMMFs have 45 percent of their assets in commercial bank deposits (jumbo C.D.s and bankers' acceptances) and 42.5 percent of their assets in commercial paper. The remainder of assets is in U.S. government securities. This asset distribution represents a change since the mid-1970s, and represents a shift out of risk-free government securities into somewhat more risky (and higher yielding) commercial paper. While these numbers represent aggregate figures, they tend to mask the tremendous differences in portfolio composition between funds. Tables 8 and 9 show this distribution for the 10 largest MMMFs. Appendix III provides similar data for all MMFs in existence as of September 1981.

These tables show several interesting things. First, the ten largest funds accounted for over half of MMMFs' assets. The largest two funds, managed by Merrill Lynch, have between 40-50 percent of their assets in

Table 5

Percentage of Total Flow of Financial Assets Acquired by Money Market Funds

	1974	1975	1976	1977	1978	1979	1980
Demand Deposits and Currency	-	-	-	-	-	-	-
U.S. Government Securities	.29	.81	.23	-.32	.63	4.67	2.05
Open Market Paper	3.39	*	4.94	.67	9.85	38.52	57.48
Total Time Deposits	2.03	.56	-.64	.24	2.82	14.64	8.90
Commercial Bank Time Deposits	2.82	1.65	-1.74	.55	5.38	27.68	13.93
Large Time Deposits** (C.D.s) in C.B.s ($100,000+)	3.52	*	*	1.17	6.16	118.33	31.74

* = Total flow was negative.

** Assumes all MMMFs' holdings are in large C.D.s.

Source: Derived from Federal Reserve Board, Flow of Funds Outstanding, May 1981

Table 6

Percentage of Total Financial Assets Held
by Money Market Funds

	1974	1975	1976	1977	1978	1979	1980
Demand Deposits and Currency	-	-	-	-	.02	.02	.02
U.S. Government Securities	.02	.16	.17	.12	.18	.61	.79
Open Market Paper*	.89	.75	1.21	1.23	3.19	12.34	17.77
Total Time Deposits	.20	.24	.15	.16	.43	1.46	2.23
Commercial Bank Time Deposits	.38	.46	.30	.33	.86	2.93	4.36
Large Time Deposits** in C.B.s ($100,000+)	.93	1.33	1.01	1.14	2.54	9.21	13.12

*Open Market Paper = Commercial Paper Plus Banker's Acceptances.

**Assumes all MMMFs' holdings are in Large Time Deposits at C.B.s.

Source: Derived from Federal Reserve Board, Flow of Funds Outstanding, May 1981

Table 7

Money Market Funds Percentage Asset Distribution
(End of Year)

	1974	1975	1976	1977	1978	1979	1980
Demand Deposits and Currency	-	-	-	-	.93	.22	.27
Time Deposits	66.67	58.33	41.67	46.15	49.07	43.14	44.89
U.S. Government Securities	6.25	25.00	30.55	23.08	13.89	12.39	11.02
Open Market Paper	27.08	13.89	25.00	28.21	34.26	42.70	42.47
Miscellaneous	-	2.78	2.78	2.56	1.85	1.55	1.35

Source: Federal Reserve Board, Flow of Funds Outstanding, May 1981

U.S. government securities, far higher than the typical fund. Second, there are several funds which appear to be specializing in more risky assets such as commercial paper and foreign bank certificates. Clearly, MMMFs are offering a wide range of investments to the consumer, who is hopefully aware of the distribution of his uninsured funds. We now proceed from our qualitative analysis to a more detailed theoretical and empirical analysis of investor decisions with respect to MMMFs.

Table 8

Ten Largest Money Market Funds (August 5, 1981)

	Assets ($ millions)	Average Maturity (Days)	7-Day Average Yield (%)	30-Day Average Yield (%)
1. Merrill Lynch Ready Assets	18,564.6	32	16.9	16.6
2. Merrill Lynch CMA Money Trust	8,596.0	27	17.2	17.2
3. InterCapital Liquid Assets	7,833.6	37	17.5	17.1
4. Dreyfus Liquid Assets	6,704.0	30	17.4	17.4
5. Cash Reserve Management	5,844.6	24	17.8	17.6
6. Paine Webber Cash Fund	4,607.0	33	17.0	17.0
7. Daily Cash Accumulation	4,527.7	24	17.6	17.6
8. Shearson Daily Dividend	4,400.8	20	17.4	17.3
9. Fidelity Daily Income	3,491.8	29	17.1	17.0
10. Temp Fund	3,283.9	31	17.3	17.1

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

Table 9

Percentage Asset Distributions of 10 Largest Money Market Funds

	U.S. Govt. Securities	Domestic * C.D.s	Foreign * C.D.s	Overnight Time Deposits London	Bankers' Acceptances	Commercial Paper	Repurchase Agreements	Other Net Assets (Liabilities)
1. Merrill Lynch Ready Assets (3-31-81)	49.3	32.5	-	-	7.9	7.6	14.9	(12.2)
2. Merrill Lynch CMA Money Trust (3-31-81)	36.1	46.6	-	-	7.5	17.6	-	(7.8)
3. Intercapital Liquid Assets (2-28-81)	9.2	59.9	-	-	-	30.3	.3	.5
4. Dreyfus Liquid Assets (3-5-81)	1.0	23.6	21.5	4.3	13.9	12.4	1.0	.9
5. Cash Reserve Management (12-31-80	4.3	10.4	8.1	-	6.3	70.0	.9	-
6. Paine Webber Cash Fund (3-31-80)	11.4	20.54	-	-	-	65.36	2.21	.45
7. Daily Cash Accumulation (6-30-80)	-	2.0	2.0	-	1.0	90.0 (+2.0 Foreign)	-	3.0
8. Shearson Daily Dividend (3-31-80)	-	-	76.2	14.3	-	2.9	5.8	.8
9. Fidelity Daily Income (5-31-81)	-	47.8	-	-	20.6	47.8	-	5.4
10. Temp Fund (3-31-81)	8.5	28.3	-	-	16.4	40.4	2.2	4.2

Sources: Most recent available prospectus or investment summary report for each fund.

* Certificates of Deposit.

II. Theoretical Specification of the Model

The basic foundation of the money market funds model is the theory of portfolio selection.[1] This theory assumes that households arrange their asset holdings so as to maximize utility, subject to the wealth constraint that the sum of all net asset holdings is identically equal to net worth. Thus, the demand for money market fund shares depends on the utility maximization decisions of households with respect to their allocation of overall wealth. This reasoning assumes that households make their multi-period consumption decisions, determining their dynamic levels of consumption and wealth holdings, prior to making their portfolio allocation decisions.

Portfolio theory models the household's demand for assets as a function of the household's tastes and preferences concerning risk factors and liquidity, the relative prices (expected rates of return) of assets, and the household's wealth constraint. This formulation leads to the standard conclusion of portfolio theory that the household's allocation of net worth is based on risk-return considerations, subject to a wealth constraint. Thus, the proportion of net worth held in any particular asset should be a function of the expected rate of return on the asset, the expected rates of return on alternative assets, the covariance of the rate of return on the asset with that of every other asset, and some measure of risk aversion or risk preference.

This type of portfolio theory analysis has typically been implemented through a relatively simple stock demand model. The optimum or desired proportion of total wealth to be held in any asset i, a_i^*, is positively

related to the own rate of return on the asset and inversely related to the rates of return on competing assets. Thus,

$$a_i^* = f(r_1^e, \ldots, r_i^e, \ldots, r_n^e), \tag{1}$$

where

r_i^e = the perceived or expected rate of return on asset i.

This means that the optimum or desired stock for asset type i is positively related to the own rate of return for the asset, inversely related to the rates of return on competing assets, and positively related to the household's wealth. The relationship between the desired stock of asset i and the desired proportion of net worth to be allocated to asset i can be summarized as follows:

$$A_i = a_i W, \tag{2}$$

which means

$$A_i^* = a_i^* W, \tag{3}$$

where

A_i = holdings of asset i; the asterisk denotes the desired value.

$W = \sum_{i=1}^{n} A_i$ = wealth (net worth).

Substituting (1) into (3), we obtain:

$$A_i^* = f(r_1^e, \ldots, r_i^e, \ldots, r_j^e)\, W. \tag{4}$$

More generally, portfolio theory also implies the desired proportion of net worth to be held in a given asset should also depend on the variance of the return on that asset and the covariance of the rate of return of that asset with that of every competing asset. Yet in most specifications of savings deposit flow models (the models most closely akin to our money market fund flows model), the risk element of portfolio theory is ignored or assumed constant. This treatment has been justified by the small variance and covariance terms for assets like S&L deposits and close risk substitutes such as commercial bank deposits, Treasury bills, money market fund shares, and commercial paper. Our model of money market fund shares follows this conventional treatment and assumes that both risk and liquidity differences between assets types are constant. Thus our model will only capture these differential characteristics of assets to the extent they are reflected in households' perceptions of interest rate differentials.

Using the desired stock demand function specified in equation (4), it is then possible to specify a dynamic money market fund model. Equation (4) describes the equilibrium holdings of each asset i, but actual stocks may not instantly adjust to these desired values. Delays in the adjustment to equilibrium stock levels may be caused by delays in adapting perceived or expected interest rates to changes in actual rates, inertia in habits, the preferences of individuals to spread some adjustments over time, and the transaction costs of reallocating wealth among different assets. These transactions costs tend to be greater, the larger and more rapid is the adjustment. The delays caused by lags in adjusting perceived interest rates

to changes in actual rates are incorporated directly into the model by the approximations of perceived rates of return. The other causes of delayed adjustment can be handled through the traditional stock adjustment model, in which the adjustment per unit of time is hypothesized to be some function, $\lambda(0<\lambda\leq 1)$, of the gap between the long-run equilibrium value and the beginning of period value of the relevant variable. Following this specification, we can rewrite equation (4) as

$$\Delta A_{it} = A_{it} - A_{it-1} = \lambda(A^{*}_{it} - A_{it-1}),\ 0<\lambda\leq 1 \tag{5}$$

where t denotes time.

Rewriting (5), we obtain

$$A_{it} - A_{it-1} = \lambda A^{*}_{it} - \lambda A_{it-1} \tag{6}$$

substituting (3) in to (6) we obtain

$$A_{it} - A_{it-1} = \lambda a^{*}_{it} W_t - \lambda A_{it-1} \tag{7}$$

which can also be written

$$\frac{A_{it} - A_{it-1}}{W_t} = \lambda a^{*}_{it} - \frac{\lambda A_{it-1}}{W_t}\ . \tag{8}$$

Substituting (1) into (7) and (3), we derive the following flow equations:

$$A_{it} - A_{it-1} = \lambda f(r^{e}_{1}, \ldots, r^{e}_{i}, \ldots, r^{e}_{n})\ W_t - \lambda A_{it-1} \tag{9}$$

and

$$\frac{A_{it} - A_{it-1}}{W_t} = \lambda f(r_1^e, \ldots, r_i^e, \ldots, r_n^e) - \frac{\lambda A_{it-1}}{W_t} . \qquad (10)$$

This model can be implemented empirically in either form (9) or form (10).

One qualification must be made concerning the traditional stock adjustment model. This qualification can be seen by following Modigliani (1972) and rewriting equation (7) as:

$$A_{it} - A_{it-1} = \lambda a_{it}^* \Delta W_t + \lambda(a_{it}^* W_{t-1} - A_{it-1}). \qquad (11)$$

Equation (11) reveals that this model implies an equally slow adjustment in correcting the initial stock imbalance and in the allocation of a new flow of wealth. Yet, since the adjustment lag arises largely from the costs of shifting from previously held assets into new ones, the lag should not be as great for newly accumulated wealth that does not accrue in the form of capital gains. As Modigliani (1972) points out, the result is that when equations of form (7) are estimated, the speed of adjustment tends to be underestimated. Our empirical tests attempt to test for this effect.

III. Empirical Specification of the Model

The estimated model is a monthly money market funds assets (or shares) flow model.[2] The basic model estimated is from equation (10) and takes the form of

$$\frac{\Delta MMFTA}{WLTH} = \lambda f(MMFAY^e, RRC^e, ZRTB6^e) - \frac{\Delta MMFTA(-1)}{WLTH} \qquad (12)$$

where

MMFTA = money market funds total assets, in billions of current dollars

$MMFAY^e$ = expected or perceived money market funds average yield in percentage points

RRC^e = expected or perceived interest rate on savings deposits at S&Ls in percentage points

$ZRTB6^e$ = expected or perceived six-month Treasury bill certificate rate in percentate points

WLTH = net worthof households in trillions of current dollars.

The exact specification of the basic equation is as follows:

$$\frac{\Delta MMFTA}{WLTH} = b_0 + b_1 \frac{MMFTA(-1)}{WLTH} + b_2 [MMFAY(-1)-RRC(-1)]$$

$$+ b_3 [MMFAY(-1) - ZRTB6(-1)] \qquad (13)$$

Since our stock adjustment model is really concerned with the reallocation of the household's portfolio resulting from changes in relative interest rates, we utilize interest rate spread terms rather than entering each relevant rate of return separately in our empirical implementation.

Additionally, although our estimating equations include only the ceiling rate of passbook accounts, money market fund yield, and the six-month Treasury bill certificate rate, these rates are good proxies for returns on other assets that are closely substitutable with money market fund shares. In a fully specified flow of funds system, a full set of asset equations would be specified with each equation utilizing a full set of alternative rates of return. As Gramlich and Hutlett (1972) and Brainard and Tobin (1968) discussed, this type of fully specified system yields estimations which contain coefficient restrictions dictated by the risk-return portfolio model and balance sheet identities. Yet, because the correlation among the interest rates of the set of assets substitutable with money market fund shares is so high, multicollinearity prevents additional interest rate spread terms from entering our estimated equations significantly.

IV. Empirical Results

The specification described in equation (13) of the previous section was estimated using both ordinary least squares regressions and generalized least squares regressions using the Hildreth-Lu autocorrelation correction on monthly data for the period from 1975:11 to 1981:4.

The results of estimating our basic equation are shown in Table 10. Columns I and II show the results for the OLS and GLS version of equation (13) over the entire sample period. The spreads between money market mutual fund interest rates and MMC interest rates and passbook account interest rates are highly significant. This strongly confirms our hypothesis that consumers and investors are reacting to interest rate differentials when choosing among financial assets. The regression results are completely consistent with a careful examination of the actual data used in the regression, illustrated in Table 11. The larger the interest spreads between the unregulated MMMF accounts and the regulated financial institution accounts, the greater the percentage of MMMF flows. The periods of massive increases in MMMFs' assets, in the late spring and early summer of 1980, and in the first half of 1981 coincided with rate spreads in favor of MMMFs' of 200 to 400 basis points over MMC's and 800 to 1,100 basis points over passbook accounts. Regulated financial institutions clearly could not meet this rate competition.

In addition to the rate spread variables, the lagged stock and the constant were also significant. Attempts to introduce the expected rate of return on other assets were unsuccessful, primarily because of

Table 10

Money Market Fund Flow Equations

Variable	I	II	III	IV	V
MMFTA(-1)/WLTH	-.0352 (3.10)	-.0344 (4.10)	.0295 (.31)	-.03413 (2.43)	-.03268 (2.93)
MMFAY(-1) -RRC(-1)	84.43 (6.66)	85.19 (8.97)	39.83 (2.16)	88.80 (4.34)	87.65 (7.04)
MMFAY(-1)-ZRTB6(-1)	200.12 (9.73)	187.2 (10.24)	7.42 (.54)	205.76 (7.05)	42.08 (.54)
MMFAY(-1)ZRTB6(-1)* MMCDUM	-	-	-	-	162.4 (2.09)
Constant	108.1 (3.12)	102.3 (4.33)	-2.77 (.04)	98.07 (1.11)	61.5 (1.52)
$\bar{R}^2$	.902	.886	.766	.869	.907
SER	117.7	127.0	112.7	158.7	114.7
D.W.	2.12	1.25	2.29	1.97	2.16
ρ^2	.4	-	.8	.3	.4
Method	GLS	OLS	GLS	GLS	GLS
Range	1975:11-1981:4	1975:11-1981:4	1975:11-1978:5	1978:6-1981:4	1975:11-1981:4

*t-statistics in parentheses.

Table 10

Money Market Fund Flow Equations (continued)

Variable	VI	VII	VIII
MMFTA(-1)/WLTH	-.04818 (3.98)	-.04936 (3.69)	-.0321 (3.89)
Interest Spread *DUM762	67.18 (.41)	55.14 (.32)	106.0 (.64)
Interest Spread *DUM771	40.7 (.58)	39.23 (.46)	38.4 (.25)
Interest Spread *DUM772	23.45 (.34)	33.23 (.38)	48.1 (.69)
Interest Spread *DUM781	129.2 (.83)	98.41 (.54)	43.2 (.49)
Interest Spread *DUM782	65.4 (1.59)	61.64 (1.24)	150.9 (1.95)
Interest Spread *DUM791	94.1 (6.60)	91.15 (5.04)	31.6 (.11)
Interest Spread *DUM792	119.1 (8.93)	115.1 (7.57)	573.8 (4.54)
Interest Spread *DUM801	105.2 (10.8)	110.1 (9.77)	271.5 (11.3)
Interest Spread *DUM802	101.8 (4.25)	94.7 (4.00)	209.1 (7.10)
Interest Spread *DUM811	131.7 (13.13)	133.8 (11.7)	339.6 (11.15)
MMFAY-RRC	-	-	69.8 (8.5)
Constant	59.4 (1.60)	64.6 (1.43)	64.3 (2.28)
$\bar{R}^2$	.884	.890	.906
SER	128.1	124.7	115.00
D.W.	1.60	1.84	2.08
ρ^2	-	.3	-
Method	OLS	GLS	OLS
Range	1975:11-1981:4	1975:11-1981:4	1975:11-1981:4

*t-statistics in parentheses.

Table 11

Money Market Fund Flows Versus Rate Spreads

DATE	ΔMMFTA / WLTH*1000	MMFAY -ZRTB6	MMFAY-RRC	DATE	ΔMMFTA / WLTH*1000	MMFAY-ZRTB6	MMFAY-RRC
75 11	0.006	-0.385	0.750	78 9	0.064	-0.243	1.870
75 12	0.006	-0.051	0.450	78 10	0.090	-0.698	2.000
76 1	0.012	-0.333	0.350	78 11	0.087	-0.863	2.380
76 2	-0.011	0.112	0.100	78 12	0.162	-0.954	3.000
76 3	0.006	-0.044	-0.150	79 1	0.365	-0.237	3.910
76 4	-0.004	-0.413	-0.175	79 2	0.279	0.270	4.470
76 5	-0.016	-0.201	-0.250	79 3	0.334	0.170	4.330
76 6	-0.025	-0.625	-0.275	79 4	0.392	0.140	4.360
76 7	-0.018	-0.609	-0.075	79 5	0.347	0.060	4.300
76 8	0.009	-0.297	0.050	79 6	0.428	-0.020	4.270
76 9	0.001	-0.241	-0.075	79 7	0.642	0.550	4.360
76 10	0.015	-0.211	-0.150	79 8	0.342	0.210	3.900
76 11	0.022	0.027	-0.150	79 9	0.323	0.130	4.030
76 12	0.010	0.056	-0.250	79 10	0.555	0.105	4.730
77 1	0.012	0.287	-0.450	79 11	0.241	-0.219	5.620
77 2	-0.005	-0.133	-0.600	79 12	0.676	0.704	7.060
77 3	-0.006	-0.296	-0.650	80 1	0.876	0.853	7.200
77 4	-0.007	-0.283	-0.650	80 2	0.855	1.019	7.370
77 5	-0.026	-0.190	-0.650	80 3	0.374	0.119	7.340
77 6	-0.011	-0.568	-0.625	80 4	-0.105	-1.170	8.430
77 7	-0.016	-0.398	-0.450	80 5	0.814	2.182	10.300
77 8	0.007	-0.501	-0.400	80 6	1.167	4.311	7.960
77 9	0.009	-0.885	-0.325	80 7	0.470	2.872	4.590
77 10	0.012	-0.891	-0.150	80 8	0.094	0.519	3.120
77 11	0.011	-0.985	0.175	80 9	-0.216	-1.203	2.740
77 12	0.046	-0.783	0.400	80 10	-0.115	-1.476	3.570
78 1	0.095	-0.602	0.525	80 11	-0.026	-1.276	4.790
78 2	0.070	-0.760	0.675	80 12	-0.181	-1.572	6.540
78 3	0.080	-0.570	0.920	81 1	1.004	0.580	9.850
78 4	0.077	-0.404	0.990	81 2	1.343	3.217	11.600
78 5	0.099	-0.490	0.960	81 3	1.485	2.426	11.060
78 6	0.064	-0.709	1.060	81 4	1.110	2.307	9.790
78 7	0.082	-0.660	1.290	81 5	-	0.786	8.720
78 8	0.078	-0.431	1.790	81 6	-	0.146	9.980

the multicollinearity discussed earlier. The addition of the AAA bond rate, the 90-day Treasury bill rate, the commercial paper rate, and the expected return on stock investment added no explanatory power to the estimated equations.[3]

Overall the basic MMMF equations explain about 90 percent of the variance in the flow of assets into MMMFs.

A second hypothesis, that flows into MMMFs greatly accelerated after the introduction of money market accounts (MMCs) in June of 1978 at financial institutions, was also tested. Column III shows the base equation from 1975:11 to 1978:5, while column IV shows the same equation from 1978:6 to 1981:4. An examination of the coefficients would appear to show a major structural shift in the equation. However, applying the Chow test for a linear restriction on all parameters indicates that we cannot reject the hypothesis that the relationship is stable.* However, testing for equality of the coefficient on the interest rate spread term between money market fund rates and MMC interest rates, we find a significant upward shift in the coefficient in the post 1978:6 period.** Column V, in which we include a dummy for the introduction of the money market certificate account at regulated financial institutions strongly

* Chow Test: $F = \frac{(860{,}000 - 788{,}000)/4}{788/58} = 1.32\ (4,57)$

** First period coefficient 95 percent confidence range: 7.42 ± 12.86

Second period coefficient 95 percent confidence range: 205 ± 29.1

confirms this result. The introduction of the MMC leads to a four-fold increase in consumer and investor sensitivity to interest rate differentials among asset types. The advertising and education effect which accompanied the MMC had a substantial impact on consumers and led to a sharp acceleration in MMMF growth.

The final hypothesis that we wanted to test is really just an extension of the "MMC effect hypothesis" and concerns the question of a continuous increase in the learning experience of the consumer. To put it more succinctly, have consumers' interest rate sensitivities increased further since 1978? Columns VI, VII, and VIII in Table 8 show the results of these tests. A series of dummy variables representing different time periods was interacted with both interest rate spread variables. While the results are somewhat mixed, other than the pre-1978 - post-1978 difference illustrated earlier, there is not strong evidence of an additional consumer response. The increased flows into MMMFs in the spring of 1980 and 1981 are merely a result of larger interest rate spreads rather than greater consumer interest rate sensitivity. The "MMC effect" is, however, still strongly present in these results.

V. Conclusions

The rapid growth and proliferation of the money market mutual fund is a rational response of the consumer-investor to the inability of regulated financial institutions to offer market interest rates on deposit accounts. It appears from our results that the piecemeal deregulation of the deposit market has, in fact, accelerated the growth

of the MMMFs through a "demonstration or consumer education effect" arising from the introduction and extensive advertising of the money market certificate.

The consequences of this ad hoc deregulation of the financial markets has led to a major and probably unnecessary distortion of credit flows. Money market funds have, for the most part, attracted funds from the regulated financial sector and merely recycled them back to the commercial lending system. The large commercial banks are probably indifferent to the process, but small commercial banks and savings and loans received little of money market fund investments. The consumer-investor, as long as they are investing with full knowledge of the risks they are assuming, are clearly better off because of the new investment choices available. Finally, in a macro-economic sense, the piecemeal deregulation which has led to the rise of MMMFs has unfortunately created a dangerously unbalanced financial system with investments being concentrated in the short end of the market. A full deregulation of the deposit markets would allow financial institutions and consumer-investors to choose among market rate insured deposits over the full deposit maturity range. Full deregulation of financial institutions will, in all likelihood, in turn, lead to the end of the money market mutual fund experiment in ad hoc deregulation.

APPENDIX 1

Money fund report

Funds with assets of $100 million or more available to individual investors. For the period ended Sept. 9, 1981. Compiled by "Donoghue's Money Fund Report." Weekly average yields are published in The Examiner on Fridays.

Net Assets ($Millions)	Fund	(%) Yield 30-Day Average	(%) Yield 12-Months to date	Ave. Maturity in days	Portfolio holdings (%) U.S. Treas.	Other U.S. Govt.	Repos	CDs	Bank Accept.	Commcl. Paper	Euro$, - CDs, BAs, TDs	Yankee$, CDs, BAs	Other
214.2	Alex Brown Cash Res	17.3	—	26	—	—	—	3	4	93	—	—	—
1,718.1	Alliance Capital Reserves	17.2	14.2	24	2	—	—	18	22	58	—	—	—
306.4	American General	18.0	14.8	20	—	—	1	—	2	97	—	—	—
334.3	American Liquid Trust	16.9	14.2	25	—	—	7	50	43	—	—	—	—
105.5	BIRR Wilson Money Fund	17.2	—	20	—	—	6	35	40	19	—	—	—
219.8	Boston Company Cash Mgmt.	17.4	13.8	21	—	2	3	2	—	88	—	5	—
1,313.7	Capital Preservation Fund	15.7	13.2	5	43	—	57m	—	—	—	—	—	—
553.1	Capital Preservation Fund II	16.4	14.2	2	—	—	100m	—	—	—	—	—	—
230.8	Cardinal Government Securities	16.7	—	13	9	61	30	—	—	—	—	—	—
3,007.6	Cash Equivalent Fund	18.0	14.6	31	—	—	—	—	—	53	24	23	—
612.4	Cash Management Trust	17.6	14.0	13	—	—	26	17	4	29	—	19	1
5,203.5	Cash Reserve Management	18.0	14.6	27	9	1	2	8	2	65	13	—	—
804.2	Columbia Daily Income	17.2	14.0	23	—	—	7	1	36	56	—	—	—
285.9	Composite Cash Management Co.	17.6	14.3	29	—	—	1	11	—	63	—	25	—
1,283.1	Current Interest	17.3	14.0	23	—	—	—	15	10	75	—	—	—
806.1	DBL Cash Fund	17.6	—	28	—	—	—	10	8	60	22	—	—
4,872.1	Daily Cash Accumulation	17.8	14.8	23	7	—	—	15	2	67	6	—	3a
772.9	Daily Income	16.8	13.8	31	5	13	8	42	5	25	—	—	2
1,711.9	Delaware Cash Reserves	17.5	14.4	28	—	—	—	3	11	34	44	8	—
239.0	Dreyfus Govt. Series	16.4	13.4	58	61	—	39	—	—	—	—	—	—
7,310.0	Dreyfus Liquid Assets	17.4	14.0	32	—	—	—	33	11	20	36	—	—
106.1	EGT Money Market Trust	17.3	—	27	—	—	—	4	4	41	36	10	5
223.9	Eaton & Howard Cash	17.3	14.4	31	—	—	—	29	1	70	—	—	—
570.8	ED Jones Dly Passport	17.1	13.8	27	—	—	—	6	1	37	34	14	8
238.1	Equitable Money Mkt Acct.	17.3	—	26	—	—	—	23	14	37	26	—	—
127.0	Fahnestock Daily Income	17.0	—	25	1	13	10	34	10	32	—	—	—
910.5	FedFund	16.4	13.6	31	8	47	45	—	—	—	—	—	—
2,670.3	Fidelity Cash Reserves	17.4	13.9	28	—	2	—	9	1	8	30	50	—
3,620.5	Fidelity Daily Income	17.3	13.8	29	—	2	3	39	31	25	—	—	—
287.1	Financial Daily Income	18.0	14.8	16	—	—	—	—	1	99	—	—	—
533.9	First Investors Cash Mgt.	17.3	14.6	25	—	—	—	57	34	9	—	—	—
959.9	First Variable Rate	17.0	13.9	17b	7	20	73	—	—	—	—	—	—
902.6	Franklin Money Fund	17.4	14.3	23	—	—	6	36	39	19	—	—	—
887.0	Fund/Gov't. Investors	17.0	13.6	16	19	51	30m	—	—	—	—	—	—
415.8	Government Investors Trust	17.2	14.3	23	—	8	91	1	—	—	—	—	—
636.5	Gradison Cash Reserves	17.2	14.1	26	—	—	—	18	22	60	—	—	—
108.6	Hilliard Lyons C.M., Inc.	16.8	—	7	28	—	72	—	—	—	—	—	—
1,016.1	IDS Cash Management	17.5	14.3	27	—	—	—	21	23	53	3	—	—
596.7	INA Cash Fund Inc.	17.6	14.1	30	—	—	—	19	10	62	9	—	—
8,243.5	InterCapital Liquid Assets	17.6	14.1	33	1	—	—	62	1	36	—	—	—
478.1	John Hancock Cash Mgt.	17.3	14.2	28	—	—	—	12	2	69	—	17	—
2,559.8	Kemper Money Market	18.0	14.6	35	—	—	—	—	—	55	26	29	—
259.6	Legg Mason Cash Res. Trust	17.2	13.8	29	—	—	1	18	3	67	—	—	11
275.2	Lehman Cash Mgt., Inc.	17.7	—	26	—	—	—	—	—	27	37	36	—
222.5	Lexington Money Market	17.9	14.3	20	—	—	—	—	—	87	—	13	—
1,965.4	Liquid Capital Income	17.3	14.4	21	—	25	3	20	5	15	—	—	32
334.4	Lord Abbett Cash Reserve	17.0	14.2	25	—	—	—	44	13	43	—	—	—
294.0	MIF/Nationwide M.M.	17.2	13.9	29	3	1	—	8	25	63	—	—	—
835.3	Mass Cash Mgt. Trust	17.7	13.9	30	—	—	—	2	1	71	26	—	—
142.5	McDonald Money Market	17.5	—	23	—	—	9	33	10	16	32	—	—
9,639.6	Merrill Lynch CMA Money Trust	17.6	13.9	27	12	—	—	43	10	35	—	—	—
457.8	Merrill Lynch Government	16.5	13.7	20	67	—	33m	—	—	—	—	—	—
1,357.9	Merrill Lynch Institutional	17.5	14.1	22	3	1	2m	52	5	37	—	—	1
9,348.1	Merrill Lynch Ready Assets	17.3	13.7	34	32	—	—	34	7	27	—	—	—
205.0	Midwest Income Short Term Govt.	16.0	13.3	34	23	55	22m	—	—	—	—	—	—
453.4	Money Market Management	17.2	13.7	31	—	—	—	12	—	39	34	7	8
3,516.0	MoneyMart Assets	17.6	14.5	28	—	—	3	25	5	43	24	—	—
405.1	Mutual of Omaha	17.3	14.4	20	—	4	1	4	2	82	7	—	1
546.9	NEL Cash Mgt. Trust	17.6	13.9	29	—	—	—	19	13	48	20	—	—
2,588.5	NRTA-AARP U.S. Govt M.M. Tr.	16.0	13.8	32	3	58	38	1	—	—	—	—	—
1,920.9	National Liquid Reserves	17.5	14.2	27	—	—	—	10	5	71	14	—	—
1,559.1	Oppenheimer Money Market	17.6	15.0	22	4	6	—	1	2	68	—	—	19a
4,923.6	Paine Webber Cashfund	17.2	14.0	32	6	3	1	31	19	40	—	—	—
360.2	Putnam Daily Dividend Tr.	17.1	14.1	22	—	—	—	19	22	27	18	14	—
3,214.1	Reserve	17.3	14.7	19	—	—	23	10	2	—	59	—	6
178.2	St. Paul Money Fund, Inc.	16.0	14.5	18	—	5	—	3	1	91	—	—	—
1,172.9	Scudder Cash Investment Tr.	17.4	14.6	19	9	—	1	31	9	50	—	—	—
4,710.6	Shearson Daily Dividend, Inc.	17.4	14.4	23	—	—	—	4	3	22	71	—	—
255.6	Shearson Govt. Agency	16.2	—	23	8	76	16	—	—	—	—	—	—
677.8	SteinRoe Cash Reserves	17.6	14.3	26	—	—	1	16	5	64	14	—	—
284.0	Short-Term Income	16.9	13.8	26	5	13	12	40	10	20	—	—	—
244.2	T-Fund	16.1	13.8	18	55	—	45	—	—	—	—	—	—
2,909.0	T. Rowe Price Prime Reserve	17.5	14.7	16	—	—	2	12	—	42	21	23	—
3,481.4	TempFund	17.2	14.1	28	8	—	2	32	16	42	—	—	—
242.8	Transamerica Cash Reserves	17.6	—	27	—	—	2	11	6	48	33	—	—
182.2	Trust/Cash Reserves	17.1	13.7	27	—	—	—	7	—	39	36	3	15
305.9	Tucker Anthony Cash Mgmt.	17.3	—	23	3	8	—	11	6	72	—	—	—
100.1	USAA M.M. Fund	17.3	—	35	—	2	—	18	11	69	—	—	—
745.7	Union Cash Mgt. Inc.	17.3	15.0	19	—	—	—	—	—	14	52	34	—
448.1	United Cash Management	17.8	14.5	24	—	—	—	1	2	75	—	22	—
379.8	Value Line Cash	18.4	15.1	22	3	—	—	—	—	97	—	—	—
975.0	Vanguard Money Mkt. Trust	17.7	14.3	31	4	15	6	24	12	39	—	—	—
1,140.2	Webster Cash Reserve	17.3	14.2	24	—	4	6	41	9	30	10	—	—

Yields represent annualized total return to shareholders for past 30-day and 1 year periods. Past returns are not necessarily indicative of future yields. Investment quality and maturity may vary among funds.

NOTES: a—Letters of credit; b—average term to next rate adjustment date; f—govt.-guaranteed loan participations; g—includes acceptances of and deposits in full U.S. branches of foreign banks; h—yield reduced by service fee; m—U.S. Treasury obligation purchased under re-purchase agreements; n—this fund charges a $100 one-time new account charge; p—CDs of foreign branch of U.S. bank only. "—" (under 12 month yield) this fund not yet a year old.

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APPENDIX II

Data Code

Definitions of Variables and Sources of Data

MMFTA = Money market funds total assets, in millions of current dollars. Source: Donoghue's Money Fund Report of Holliston, Ma.

ΔMMFTA = MMFTA - MMFTA(-1)

MMFAY = Money market funds average yield, in percentage points. Source: Donoghue's Money Fund Report of Holliston, Ma.

RRC = Maximum interest rate payable on savings deposits (passbooks) at savings and loan associations and mutual savings banks, in percentage points. Source: Federal Reserve Bulletin, May 1981.

ZRTB6 = Six-month Treasury bill rate in percentage points. Source: Federal Reserve Bulletin.

WLTH = Net worth of households, in trillions of current dollars, monthly interpolation of quarterly data with interpolation based on monthly personal income from national income accounts. Source: Board of Governors of the Federal Reserve System.

Dummy Variables

MMCDUM = 1, June 1978 to April 1981.

DUM7X1 = 1, January 197x to June 197x.

DUM7X2 = 1, July 197x to December 197x.

FOOTNOTES

[1]The analysis used in this section for developing the money market funds flow model follows the general outline of the portfolio theory analysis utilized by a number of authors, such as Rosen (1977), Modigliani (1972), Gibson (1974), and Fortune (1975), in deriving models of the demand for savings deposits.

[2]The data code, Appendix II , provides the full definition of and the source of each variable.

[3]Additionally, replacing the six-month Treasury bill rate with the 90-day Treasury bill rate yields virtually identical results in each of the estimated equations.

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