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THE MACROECONOMICS OF MONEY MARKET MUTUAL FUNDS

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THE MACROECONOMICS OF MONEY MARKET MUTUAL FUNDS

The phenomenal growth of money market mutual funds (MMMFs) in the past four years and the impact of this growth on the real and financial side of the macroeconomy has become a topic of major public policy interest. This interest has been increased by the recent passage of the "Garn" bill which will allow regulated institutions to offer money market type accounts. Money market mutual funds grew from $2.4 billion in assets at the end of 1974 to nearly $75 billion in assets at the end of 1980. In the past two years they have nearly tripled again in asset size to over $230 billion.

The mushrooming growth of this new financial intermediary clearly has had a large adverse effect on the existing set of highly regulated financial intermediaries. Commercial banks, S&Ls, and mutual savings, which are all constrained by deposit rate ceilings, reserve requirements, FDIC and FSLIC regulatory scrutiny (as well as insurance), and other asset liability side regulations, have all been at a severe competitive disadvantage in directly attracting the consumers' savings dollars.

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 (and also in part caused) 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 MMCs 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 MMMFs. 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 be) created a new highly pressured environment which has resulted in a leakage of funds from traditional 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 and of the entire economy. This is especially true of thrift institutions whose ability to acquire assets other than long-term fixed rate mortgages was greatly restricted until recently. [1]

In addition to this shortening of the maturity structure of financial intermediaries, MMMFs have increased the amount of risk in the financial system. The bulk of assets in MMMFs are uninsured assets. Thus, while consumers were often obtaining a higher investment yield, they were doing so in part by investing in assets that were substantially more risky than the insured deposits of regulated financial institutions. This increased risk appears to have recently been recognized by growing numbers of consumers and is revealed in the rapid growth of MMMFs dealing exclusively in United States government securities.

Perhaps the most important macroeconomic impact of money funds (and also the most difficult to prove conclusively) is that they have redirected financial and real resources of the economy from their traditional uses. It is clear that in a partial equilibrium sense money funds have initially channeled funds to large domestic and foreign money center banks. In turn this diversion of funds from S&Ls and regional banks has initially diverted funds from housing, small business and farm loans. The extent to which this partial equilibrium analysis is sustained depends critically on the extent to which money is fungible and the degree of segmentation that exists in financial markets. Our analysis indicates that the partial equilibrium diversion of fund flows by MMMFs is substantial and that a portion of these effects is probably sustained even with the fungibility of money in the system.

Finally, the recent change in the legal environment allowing regulated financial institutions to offer money market mutual fund type accounts raises a number of significant strategic and policy questions. Can the

regulated financial institutions compete with money funds? To what extent would they merely be competing with themselves by raising the cost of their existing deposit liabilities? What will they do with any incremental money they attract? And to what extent will additional short-term money merely exacerbate the asset-liability mismatch of S&Ls? This paper attempts to address the macroeconomic "facts" as well as the strategic questions raised above.

The first portion of the paper presents an analysis of the growth of MMMFs and the effects of these fund flows on financial markets. It is concerned with aggregate fund flows and an aggregate portfolio analysis. Section II examines the asset distribution of MMMFs in detail. Particular emphasis is placed on cross tabulating the money market mutual fund portfolios with the corresponding largest banks. Section III attempts to trace the flow of money fund assets to final holders by examining the investment of the funds which came from MMMFs. Here we examine the portfolio of the largest commercial banks. The fourth section of the paper will deal with the influence of money funds on consumer interest rate elasticities, maturity preferences, and sensitivity (or lack of sensitivity) to risk. A portfolio theory model of consumer decision making will be derived. A set of econometric equations were estimated to test the increased interest rate elasticity resulting from the growth of money funds. The final section of the paper outlines some of the opportunities and risks for regulated financial institutions that will arise from the new legal environment that has recently emerged.

I. The Growth and Importance of Money Market Mutual Funds 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 1981, however, MMMFs accounted for an astounding 33 percent of all households' net acquisition of financial assets. In the first half of 1982, while this proportion was smaller, it still accounted for over 14 percent of the net acquisition of financial assets by households. In stock terms, this means that MMMFs which never accounted for more than .4 percent of households' assets now account for 10.6 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, at least in terms of yield and liquidity.

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 10 percent of funds advanced in credit markets in the first half of 1982. This makes

Table 1

Assets of Major Financial Deposit Intermediaries

	1974	1975	1976	1977	1978	1979	1980	1981	1982:2
Commercial Banks	794.9	825.9	890.7	988.7	1129.9	1252.1	1364.0	1498.3	1539.1
Savings & Loans	295.5	338.2	391.9	459.2	523.6	579.3	629.5	662.6	689.7
Mutual Savings Banks	110.3	122.2	136.4	149.5	161.2	163.3	172.6	176.8	178.7
Credit Unions	31.1	36.9	43.3	51.6	58.4	62.3	70.8	77.9	84.1
Money Market Funds	2.4	3.7	3.7	3.9	10.8	45.2	74.4	181.9	201.7

Source: Federal Reserve Board, Flow of Funds Outstanding, May 1981 and September 1982.

(Note: Tables 1-7 exclude data on tax- free money funds which held $11.1 billion of assets in September 1982.)

Table 2

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

1974	1.75
1975	.79
1976	-
1977	.09
1978	2.74
1979	12.98
1980	9.81
1981	33.13
1982 (2nd Quarter)	14.23

Source: Derived from Federal Reserve Board, Flow of Funds Accounts, Second Quarter 1982.

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	181.9	9.90
1982 (2nd Quarter)	201.7	10.63

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

Source: Derived from Federal Reserve Board, Flow of Funds Outstanding, May 1981, May 1982 and September 1982.

Table 4

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

1974	.36 %
1975	.33
1976	.21
1977	-.03
1978	.68
1979	4.16
1980	3.57
1981	13.36
1982 (1st and 2nd Quarters)	9.05

Source: Derived from Federal Reserve Board, Flow of Funds Outstanding and Flow of Funds Accounts, Second Quarter 1982.

MMMFs a critical source of funds to potential borrowers. As of 1981, the MMMFs were the major purchaser of additional open market paper (71 percent of all commercial paper) and a prime acquirer of large bank time deposits (37 percent), and United States government securities (18 percent). In a stock sense, they hold nearly 19 percent of open market paper, 7.5 percent of United States government securities and nearly 15 percent of large time deposits. 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 various liabilities of commercial banks. It should be noted that virtually none of the jumbo CDs 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 their portfolio distribution. As Table 7 shows, as of August 1982, MMMFs had 22 percent of their assets in commercial bank deposits, 35 percent of their assets in commercial paper, and 23 percent of their assets in United States government securities. The remainder of assets were in foreign deposits and repo securities. This asset distribution shows a change since the late 1970s, and represents a shift from somewhat more risky (and higher yielding commercial paper and bank CDs to risk-free government securities. While these numbers represent aggregate figures, they tend to mask the implications of differences in the portfolio composition between funds and traditional financial institutions. It is to this more detailed analysis of the portfolio composition that we now turn in Section II.

Table 5

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

	1974	1975	1976	1977	1978	1979	1980	1981	1982 (2nd Quarter)
United States Government Securities	.31	.84	.24	-.38	.66	4.90	2.13	17.97	8.91
Open Market Paper	3.39	*	4.94	.67	9.85	38.52	57.48	71.85	37.4
Total Time Deposits	2.0	.56	-.65	.24	2.26	8.50	6.20	24.8	2.5
Large Time Deposits	3.65	*	*	1.06	4.76	28.95	13.93	37.0	8.7

* = Total flow was negative

Source: Derived from Federal Reserve Board, Flow of Funds Accounts, Second Quarter 1982.

Table 6

Percentage of Total Financial Assets Held
by Money Market Funds

	1974	1975	1976	1977	1978	1979	1980	1981
Deposit Demand and Currency	-	-	-	-	.02	.02	.02	.02
United States Government Securities	.02	.16	.17	.12	.18	.61	2.18	7.46
Open Market Paper *	.89	.75	1.21	1.23	3.19	12.34	17.77	18.81
Total Time Deposits	.20	.24	.15	.16	.43	1.46	2.23	2.96
Large Time Deposits	.93	1.33	1.01	1.14	2.54	9.21	13.12	14.83

* Open Market Paper = Commercial Paper

Source: Derived from Federal Reserve Board, Flow of Funds Outstanding, May 1981 and September 1982.

Table 7

Money Market Funds Percentage Asset Distribution
(End of Year)

	1974	1975	1976	1977	1978	1979	1980	1981	August 1982
Demand Deposits and Currency	-	.80	.64	.69	.63	.15	.22	-	-
Time Deposits	66.63	56.70	39.74	44.27	41.25	26.51	28.24	24.04	21.8
Security RPs	.04	3.95	3.70	6.62	3.22	5.34	7.58	7.96	9.8
United States Government Securities	6.25	24.57	30.70	21.80	13.75	12.48	11.05	17.48	22.7
Open Market Paper	27.08	13.98	25.22	26.27	33.79	42.68	42.39	38.58	35.1
Foreign Deposits	-	-	-	.35	4.35	11.30	9.09	10.33	10.7
Miscellaneous	-	-	-	-	3.26	1.54	1.43	1.61	-

Source: Federal Reserve Board, Flow of Funds Outstanding, May 1982 and September 1982.

II. Fungibility and Segmentation in Financial Markets

The impact of this ad hoc deregulation on the sources and uses of credit in the economy has increased the probabilities of distortions in the flow of funds. Money market mutual funds are not primary lenders. Most of the funds they receive are placed with other financial institutions. They now hold about a quarter of their funds in short-term United States government and agencies as well as in tax-exempts. They also put about 11 percent of their assets in the short-term paper of the largest utilities, commercial, and industrial firms. Still almost 70 percent of their deposits go to other financial institutions in the United States or overseas.

Table 8 shows an approximation of the distribution of assets of MMMFs compared to other types of financial institutions. The results are not unexpected. Money market fund assets are concentrated in the short-term market. Most of their money is placed with firms that can utilize large amounts of liquid funds. The assets available consist primarily of liabilities of the largest banks, stock-exchange brokers, and finance companies. A sizeable share (20 percent) also goes to the foreign operations of United States banks or to the agencies and branches of foreign banks in the United States. Long-term lending as for mortgages or for plant and equipment is by necessity nil.

The table makes clear the contrast between lending by the MMMFs and most other financial institutions. For example, consider banks. In their domestic offices, they make about 40 percent of their loans in

Table 8

Comparison of Asset Types Held by Financial Institutions

June 30, 1982

Assets	Billions of Dollars				In Percent			
	Money Market Funds	Banks	Savings and Loans	Other Financial Institutions	Money Market Funds	Banks	Savings and Loans	Other Financial Institutions
Loans to financial institutions	86	173	31	67	43%	12%	4%	3%
Mortgages	-	294	512	284	-	20	74	15
Foreign loans, deposits and acceptances	40	81	*	*	20	5	*	*
Other loans and investments	25	602	25	1183	12	40	4	63
Unites States Government and state and local securities	50	320	69	300	25	21	10	16
Other	1	22	53	54	-	2	8	3
Total	202	1492	690	1888	100%	100%	100%	100%

* Included in other loans

Source: Derived from Federal Reserve Board, Flow of Funds Accounts, September 1981 and 1982 and Table 9.

the commercial, industrial, and individual categories. These include both term and medium length loans. They invest 21 percent of their funds in United States or state and municipal securities and about 20 percent in mortgages split fairly evenly between home loans and other. Their remaining portfolio is in loans to financial institutions, in foreign loans and acceptances, as well as in a broad miscellaneous group. The contrast between MMMFs and savings and loan associations is still greater. The latter lend primarily (74 percent) on mortgages. They hold some securities and minor other types of loans. Finally, a comparison is possible with the category other financial institutions which includes 10 types varying from insurance companies and pension funds to credit unions and brokers. Their investments are primarily concentrated in corporate bonds and equities, but they also make a wide variety of other loans.

A. Liquidity and Investment Costs

The reason for the high concentration of money market mutual fund assets in a limited number of names and types of securities is obvious. Examination of the lending of the MMMFs shows their investments are highly concentrated in about 40 banks and a similar small number of financial and industrial firms.

High concentrations result from the fact that only large borrowers offer enough short-term securities in the market to insure liquidity. Paper of the largest financial and nonfinancial companies can be traded in sizeable lots at minimal costs. Quotes and bids are widely available on both sides of the market.

Furthermore, the time and expense spent in evaluating the safety of firms can be used most effectively in studying the borrowers who will be constantly in the market. Few MMMFs have sufficiently large staffs to evaluate properly even the small number of companies whose debts they purchase. While ratings are available from the financial services for an additional small number of firms, most managements feel a responsibility for making some additional independent judgement as to safety and transferability of the assets they buy.

B. Market Segmentation

Some students of financial markets would argue that the concentration of purchases by the funds in the assets of a limited number of financial institutions is not a significant factor influencing who gets loans and at what rates. In their view, financial markets are sufficiently efficient so that they drive rates of return into rough congruence irrespective of where the money lands initially. A large bank won't sit on its funds. It will make loans or buy other securities. Arbitrage is a constant occurrence among different instruments in the money market.

While financial markets are extremely efficient, signs of segmentation appear as soon as one moves beyond a limited number of institutions and instruments. The number of borrowers who can sell their paper at the best rate is limited. The number who can sell any volume at all is not large. Money market funds hold appreciable investments in less than 100 of the 50,000 or so financial institutions in the United States.

Further, even very large banks and S&Ls--with the best credit--must pay a premium in comparison to the 10 largest banks which obtain nearly 30 percent of money placed by the funds outside the government. While the amount of the premium paid varies depending on the time and the amount of funds needed, it can run from 15 to 150 basis points. Even then the amount which can be borrowed and the number of firms which can enter the market are small. As an example of apparent segmentation, we note that at the end of 1981 while S&Ls as a whole had liabilities equal to about 50 percent of those of commercial banks, their borrowing in the federal funds market and on repurchase agreements were under 10 percent of the banks. They held only about 17 percent as many large time deposits of $100,000 and over as did the banks.

While the story of segmentation is difficult to pin down, market observers in California feel that S&Ls can compete well for collateralized short-term loans made to public bodies. Such loans are made on a bid basis. They are for fixed periods so that marketability is not a factor. In contrast, only a few of the largest S&Ls are able to market their CDs through the major broker dealers in any volume. The premium they had to pay over the run of the largest banks varied from 30 to 100 basis points. As a rule, the premium was in the upper half of the range.

Recently, somewhat smaller S&Ls were offering to sell insured nonnegotiable CDs of $100,000 at from even to 300 basis points above the yield of prime banks for uninsured negotiable certificates. A major

savings and loan borrower eager for money over the past year constantly offered his CD at anywhere from 150 to 250 basis points above prime borrowing rates in order to obtain funds.

Even prior to the increased concern over the safety of deposit institutions in general and S&Ls in particular, it was evident that segmentation did exist. Only a few of the associations with assets of over a billion dollars each were able to sell their paper in the money market. Those that did had to pay a premium to obtain a limited amount of funds. Most associations were closed out of the market. Regulations made it difficult if not impossible for traditional financial institutions to obtain funds from the households and individuals who found the rates paid by the MMMFs attractive. At the same time information and transaction costs meant that the institutions which could obtain the money from the MMMFs were extremely limited.

III. The Flows Through Money Market Mutual Funds

What effect did the regulations and the high information and transaction costs which led to the rapid growth of the MMMFs have on final investments? One extreme view would be that of complete believers in efficient financial markets. They would hold that money is so completely fungible that where is was placed initially would not have any effect on its final use. At an opposite extreme is a view which holds that markets are so segmented that the actual investments made in the economy depend almost entirely on which institutions first receive funds and on their customary lending practices. Institutions tend to specialize and the interaction with potential borrowers from other institutions would be minimal. While interest rates would be influenced, the differences in rates which arose would not be sufficient to move funds out of the segment which received it initially. Too much money going to real estate investment trusts led to excess credit and failures. Too much money for new issues leads to booms and crashes.

Most observers would agree that the truth lies between the two extremes. They would, however, disagree on how close to either extreme the final results are likely to be. To see whether segmentation or fungibility is likely to make any difference, one can first examine the initial flow of funds out of the MMMFs and then see how the lending done by its recipients during this period compared with the more traditional deposit institutions.

Table 9 shows the places where MMMFs placed their money. As has been noted already most of the money goes only to large institutions,

Table 9

Distribution of Assets of Money Market Funds
(Other than United States Government Securities)
September 1982
(Billions of Dollars)

Instruments	40 Largest U.S. Banks		Other United States Banks*	Foreign Banks and Companies	Financial Companies	Commercial and Industrial Companies	Total
	Domestic	Foreign Offices					
Certificates and time deposits	36.4	18.8	4.4	8.7	-	-	68.3
Repurchase agreements	13.3	-	1.1	-	10.5	-	24.9
Bank acceptances	10.6	-	1.6	1.7	-	-	13.9
Commercial paper	8.6	-	0.4	4.0	24.8	28.6	66.4
Other	0.7	-	0.3	0.4	-	-	1.4
Total	69.6	18.8	7.8	14.8	35.3	28.6	174.9

* Includes small amounts of savings and loans.

Source: Based on a statified sample of the reports of the individual money market funds and information from Donoghues' Money Fund Report.

primarily banks, but also to investment bankers through the repurchase market and to the prime names in the commercial paper market. Lending to large foreign institutions is also significant.

For purposes of analysis, we have separated the investments made in the nation's 40 largest banks from other deposit institutions. These banks received over 50 percent of the funds which were not used to purchase United States government securities. They differ considerably in their lending from the other 14,400 banks in the country because while some do an extensive retail business, most specialize in lending to large corporations and to foreign markets both from offices in the United States and abroad. An examination of the changes in liabilities of these banks since 1978 shows that the money invested in them by MMMFs amounted to more than half their increase in liabilities. They had only two other significant sources of funds. One was a sharp increase in money market certificate deposits in amounts of $10,000 to $100,000 with a minimum time of six months. The other increase occurred in their borrowings in the federal fund market and on repurchase agreements.

Table 10 gives some idea of how flows through the MMMFs might have affected lending on the assumption that segmentation is almost complete. The first three columns divide the $226 billion in added flows that went into the MMMFs between the end of 1978 and September 1982. The $88 billion that went into the 40 largest banks is divided in accordance with the actual increases in loans and security purchases made by these banks in this period. The second column divides the remaining investments by type. The third column totals the two. It is contrasted in column four

Table 10

Distribution of Additional Assets by Forty Largest Banks
and Other Deposit Institutions
1978 - 1982:3

Assets	Billions of Dollars				In Percent	
	Investments Through Money Market Funds			Other Deposit Institutions	Money Market Funds	Other Deposit Institutions
	In Forty Largest Banks	Other Fund Purchases	Total*			
Securities	5	59	64	70	28%	31%
Home Mortgages	9	-	9	73	4	32
Other Loans	53	64	117	67	52	30
Foreign	21	15	36	16	16	7
Total	88	138	226	226	100%	100%

* Other banks included in other deposit institutions.

Sources: Data for forty largest banks based on individual call reports compiled by Data Resources Inc. Extension to 1982:3 and other estimates from Federal Reserve Board, Flow of Funds and Bulletin.

with the way in which deposit institutions (the remaining banks, savings and loan associations, mutual savings banks, and credit unions) divided the funds they received in this period.

The results of this comparison are not surprising. On the assumption of segmentation, the largest gainers of funds through the intermediation of the MMMFs were the giant commercial and industrial firms (which in this period funded an inordinately high share of their needs in the short-term market) and foreign lending. Security purchases were more or less the same while the funds available for home purchases were sharply curtailed compared to what would have occurred if the investments had been distributed through the usual deposit channels.

The disparity between the two cases would appear even greater if it were possible to break down the category of other loans. Thus, for the all other deposit institutions, individual loans make up about twice the share of this category as they do for the large banks and among the other borrowers from the MMMFs.

The major banks are the primary lenders to the largest corporations. One would expect that most of their funds would be used for large scale commercial and industrial loans. Other key areas they engage in are loans to financial institutions, construction loans, and commercial mortgages

As one examines the flows in and out through the 40 largest banks, the difficulty of assuming complete segmentation becomes obvious. For example, what Table 10 shows are the ultimate results of the assumption of complete segmentation among markets. It shows how much of these banks

lending by category would have come from MMMFs on the extreme assumption that each source contributes equally to each use.

Of course, this assumption is not accurate. Since banks have to watch their liquidity, their interest rate risks, and their diversification, their sources of funds influence to some extent the type of loans they make. Equally significant, one cannot tell from the results what would have happened if this major source of funds had not existed. These banks would have had to bid in other markets.

As one possible example, assume that instead of investing in MMMFs, individuals had placed their money in MMCs. If this had occurred, instead of $88 billion they obtained from the MMMFs, the largest banks would have received less than $16 billion in deposits. In this more widely diversified market for MMCs, smaller banks and S&Ls were able to compete far more effectively. The other gainers from the intermediation by MMMFs, namely, government securities, foreign money market assets, and commercial paper would also have experienced a reduction in direct demand. But this would not have been the final result. The large banks and those who borrowed from then would have increased their bids in the market and from other institutions. They would have bought some of the money which would have flowed initially to other institutions. Still, they would have had to pay more for their funds and would have borrowed less leaving more available for other borrowers.

While the general direction of how the growth of MMMFs impacted financial markets is clear, the data leave unresolved the issue of the ultimate impact. Table 10 contrasting the lending of those who obtained

the funds with those who did not obviously overstates the case just as does the opposite view that the final lending results did not differ because investors shifted among institutions and investments in response to extremely small interest differences. In this, as in similar cases, agreement on the degree of impact cannot be obtained. Observers view the data from different perspectives and arrive at quite divergent estimates of the results.

IV. Consumer Response to Money Market Mutual Funds[2]

This section deals with the influence of money funds on consumer interest rate elasticities, maturity preferences, and sensitivity to risk. We start with a theoretical formulation of a money fund model. We then econometrically test the interest rate elasticity impact of money funds and the introduction of the MMC. We also empirically demonstrate the shortening of maturities and the changing risk behavior of consumers.

A. Theoretical Specification of the Model

The basic foundation of a money market fund model is the theory of portfolio selection.[3] 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 and inversely related to the rates of return on competing assets. 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:

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

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. While our econometric model of money market fund shares follows this conventional treatment and assumes that both risk and liquidity differences between assets types are constant, an empirical section on changing consumer maturity and risk preferences is also included. However, our econometric model only captures 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 transaction 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) into (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

$$\frac{A_{it} - A_{it-1}}{W_t} = \lambda f(r^e_1, \ldots, r^e_i, \ldots, r^e_n) - \frac{\lambda A_{it-1}}{W_t} . \tag{10}$$

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:

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

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.

B. Empirical Specification of the Econometric Model

The estimated model is a monthly money market fund assets (or shares) flow model.[4] 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 fund total assets, in billions of current dollars

$MMFAY^e$ = expected or perceived money market fund 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.

C. Econometric 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 11. 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

Table 11

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.

(continued on next page)

Table 11

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 12

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

regression, illustrated in Table 12. 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 MMCs 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 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.[5]

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 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 11 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

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* 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

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.

D. Changing Maturity Distribution of Consumers' Deposit-like Assets

In addition to the sharp increase in consumers' interest rate sensitivity that money funds and financial deregulation has caused there has also been a sharp decrease in the average maturity of deposits held by consumers. The introduction of the MMC account which was the only "deregulated account" yielding close to a market return, until the summer of 1981, the rapid proliferation of money funds, and the general inversion (and possible continued chronic inversion) of normal interest rate yields curves in the past three years, contributed to the dramatic shortening of the average maturity of consumers savings assets. Tables 13 and 14 show the breakdown of deposit liabilities of financial institution by maturity class.

Savings and loans show the most dramatic decline in average maturity. Average deposit maturity fell from over 14.4 months in 1978 to less than 8 months today.* Only the introduction of the small savers certificate (30 months) has stabilized the reduction in average maturity.

Commercial banks and mutual savings banks show a similar, though a somewhat smaller, drop in average maturity. The average maturity of deposits is only 5 months at commercial banks and just over 7 months at mutual savings banks.

* Average maturity was calculated by assuming the following deposit class maturities: Passbook (0), MMCs (3 months), Small Savers (15 months), All Savers (6 months), Other Certificates (24 months), and Large CDs (2 months).

TABLE 13

DEPOSITS BY MATURITY CLASS FOR FINANCIAL INSTITUTIONS
(BILLIONS OF DOLLARS)

		Total Savings & Time Deposits (Excluding NOWs)	Passbook	Money Market Certificates	Small Savers Certificates	All Savers	Other Certificates	Large CDs
Savings and Loans	78:1	390.1	146.0	-	-	-	232.1	10.7
	78:4	422.2	134.5	42.8	-	-	230.3	14.3
	79:4	460.7	116.1	127.8	-	-	189.5	27.4
	80:4	501.3	103.8	184.2	50.3	-	121.7	40.0
	81:4	526.9	99.8	183.7	97.7	19.8	78.3	47.6
	82(August)	531.0	99.2	175.7	126.7	22.6	48.8	54.0
Commercial Banks	78:1	529.1	217.7	-	-	-	171.3	140.1
	78:4	584.1	213.9	23.0	-	-	165.1	182.2
	79:4	627.0	192.8	103.2	1.9	-	134.9	194.2
	80:4	692.7	183.7	177.6	32.0	-	82.0	217.4
	81:4	764.2	157.2	216.3	57.1	18.6	63.8	251.2
	82(August)	835.2	157.9	234.4	79.5	23.6	66.9	272.9
Mutual Savings Banks	78:1	133.5	78.1	-	-	-	54.2	1.2
	78:4	140.9	72.3	12.8	-	-	53.9	1.9
	79:4	143.7	61.0	34.8	.9	-	43.7	3.3
	80:4	150.0	54.7	49.4	11.8	-	29.2	4.9
	81:4	152.5	47.5	49.8	19.6	4.5	25.1	6.0
	82(August)	154.5	46.6	48.5	24.9	5.9	22.4	6.2

Source: Federal Reserve Bulletin, Federal Home Loan Bank.

TABLE 14

SAVINGS & TIME DEPOSITS BY MATURITY CLASS FOR FINANCIAL INSTITUTIONS
(IN PERCENT)

		Passbooks	Money Market Certificates	Small Savers Certificates	All Savers	Other Certificates	Large CDs	Average Maturity (Months)
Savings and Loans	78:1	37.4	-	-	-	59.5	2.7	14.4
	78:4	31.9	10.1	-	-	54.5	3.4	13.5
	79:4	25.2	27.7	-	-	41.1	5.9	10.8
	80:4	20.7	36.7	10.0	-	24.2	8.0	8.6
	81:4	18.9	34.9	18.5	3.8	14.9	9.0	7.8
	82(August)	18.7	33.1	23.9	4.3	9.2	10.2	7.2
Commercial Banks	78:1	41.1	-	-	-	32.4	26.5	8.3
	78:4	36.6	3.9	-	-	28.3	31.2	7.5
	79:4	30.7	16.5	.3	-	21.5	31.0	6.3
	80:4	26.5	25.6	4.6	-	11.8	31.4	4.9
	81:4	20.5	28.3	7.5	2.4	8.3	32.8	4.8
	82(August)	18.9	28.1	9.5	2.8	8.0	32.7	5.0
Mutual Savings Banks	78:1	58.5	-	-	-	40.6	.9	9.7
	78:4	51.3	9.1	-	-	38.3	1.3	9.5
	79:4	42.4	24.2	.6	-	30.4	2.3	8.2
	80:4	36.5	32.9	7.9	-	19.5	3.3	6.9
	81:4	31.1	32.7	12.8	2.9	16.4	3.9	7.1
	82(August)	30.2	31.3	16.1	3.8	14.5	4.0	7.1

It is quite clear that this reduction in average maturity of consumer deposit liabilities has greatly increased the portfolio imbalance of regulated financial institutions. The causes of this shortening of deposit liability maturities are the availability of a deregulated short-term market rate account (the MMC), the inability until the summer of 1981 to offer a long-term market rate account, the competition of an unregulated financial intermediary specializing in short maturity assets (25-40 days), and an inverted yield-curve. All four of these ingredients were critical in explaining the observed maturity shifts.

The importance of the yield-curve inversion in causing the growth in short-term deposit and deposit-like accounts cannot be understated. Over the past decade the investor would have earned his best rate of return by remaining in short-term assets. Table 15 shows the three month, three year, and ten year treasury yield-curve. Long rates yielded less than short rates from December 1978 until April 1980 and again from November 1980 until August 1981. These periods of extended yield-curve inversion coincided with the largest growth in money funds. A return to a normal yield environment has sharply reduced the growth rate of money fund and money market certificates.

E. Changing Riskiness of Money Funds

While there is no direct way to measure the riskiness of money funds, shifts in the aggregated portfolios and differential growth rates of specialized government money funds do provide some insights. Unlike deposits at financial intermediaries money market mutual funds are not

TABLE 15

TREASURY YIELD CURVE

	3 month Treasury	3 year Treasury	10 year Treasury	10 year minus 3 month	10 year minus 3 year
1977 JAN	4.60	6.22	7.21	2.61	.99
APR	4.54	6.31	7.37	2.83	1.06
JULY	5.15	6.51	7.33	2.18	.82
OCT	6.19	7.19	7.52	1.33	.33
1978 JAN	6.45	7.61	7.96	1.51	.35
APR	6.31	7.85	8.15	1.84	.30
JULY	7.07	8.54	8.64	1.57	.10
OCT	8.13	8.62	8.64	.51	.02
1979 JAN	9.35	9.5	9.1	-.25	-.40
APR	9.49	9.43	9.18	-.31	-.25
JULY	9.26	8.94	8.95	-.31	.01
OCT	11.47	10.95	10.3	-1.17	-.65
1980 JAN	12.04	10.88	10.8	-1.23	-.08
APR	14.00	12.02	11.47	-2.53	-.55
JULY	8.13	9.27	10.25	2.12	.98
OCT	11.58	12.01	11.75	.17	-.26
1981 JAN	14.72	13.01	12.57	-2.15	-.44
APR	13.63	14.09	13.68	.045	-.41
JULY	14.70	15.15	14.28	-.42	-.87
OCT	13.87	15.5	15.15	1.28	-.35
1982 JAN	12.41	14.64	14.59	2.17	-.05
APR	12.82	14.8	13.37	1.05	-.31
JULY	11.91	14.0	13.95	2.03	-.05
SEPT	8.20	12.03	12.34	4.14	.31

insured by an agency of the United States government. The underlying assets of money funds provide the only security for money fund shareholders. As a result, the safety of investments in money funds depend on the judgment and integrity of money fund managers. On the otherhand, nearly all deposits of $100,000 or under in savings and loans, commercial banks, and mutual savings banks are insured by agencies of the United States government.

The only direct evidence that consumers realize this difference in risk has been the rapid emergence and growth of money funds that specialize exclusively in government securities. Over the past year the proportion of total MMMF assets invested in Treasury bills has nearly doubled--with a nearly 35 percent increase in the last quarter. This reflects the flight to quality that has pervaded the capital market since the Drysdale, Penn Square, and Mexico problems.

With the regulated financial institutions able to offer insured money fund accounts late this year the role of the riskiness of the uninsured money market mutual fund will clearly be accentuated.

V. Enhanced Competition

As the previous sections have shown, the growth of MMMFs was clearly related to the gap between regulated deposit interest rate ceilings at institutions and actual short-term rates in the money markets. This situation is changing rapidly. Many deposit institutions have successfully offered sweep accounts. Soon all will be able to offer competing MMMFs. Initially, these may require somewhat larger minimum balances and fewer (although smaller) transactions, but any such restrictions are only a way stop on the path to complete deregulation.

In the competition for funds, S&Ls and banks will have large apparent advantages. Their offerings will be insured directly by a federal instrumentality while the MMMFs are uninsured. Furthermore, deposit institutions are ubiquitous and people are more used to dealing with them. Money can be transferred more easily from one type of account to another. However, problems will exist. Savings and loans and banks hold large sums paying below those which MMMFs have been paying. Questions of liquidity and the increased interest rate sensitivity from a shortening of maturities will arise. Brokerage firms will want to hold money in accounts easily utilized for stock and bond purchases.

Table 16 shows an approximate distribution of the checkable and time and saving (excluding those of $100,000 and over) deposits held by households in mid-1982. Most obvious is the fact that while MMMFs did grow at an extremely rapid rate, at the end of the period they still held only about 11 percent of the total of deposit type assets of households.

Table 16

Household Deposits
(Excluding Time of $100,000 and over)
June 1982
(Billions of Dollars)

	Checkable	Small Time and Saving (Money Market Certificates)	Money Market Funds	Total
Banks	271	516 (232)	-	787
Savings and loans	9	477 (179)	-	486
Mutual savings banks	7	147 (49)	-	154
Credit unions	3	65	-	68
Money market funds	-	-	192	192
Total	290	1205 (460)	192	1687

Source: Derived from Federal Reserve Board, Flow of Funds Accounts, September 1981 and 1982.

About $1,500 billion of household deposits were still in traditional institutions, as Table 14 shows, they were in a large variety of types of accounts with a similar variation in rates paid. Over $200 billion of deposit accounts were held on demand paying no interest. Nearly $400 billion were in passbook savings or checkable accounts paying well below market interest rates. The rest were split with nearly half in MMCs and the remainder in a number of different investments including all savers, IRAs and Keoghs, and larger time deposits with rates more closely related to the market. It may be costly if the new accounts attract money from both the MMMFs and existing deposit accounts at higher rates than are now being paid.

During this major growth period of 1980-82, general purpose MMMFs, on the average, paid interest rates which yielded from 25 to 200 basis points more than the ceilings authorized for S&Ls on MMCs. At times the spreads narrowed and even became negative because of the averaging process which causes yields of both MMCs and MMMFs to lag the market. However, during this period as a whole, the auction rate for six-month Treasury bills was considerably below money market rates as is clear from Table 17.

In 1980-82, the major banks paid on average about 14.25 percent on their three-month negotiable CDs. The rate on commercial paper was about the same. In this period, the auction rate on six-month Treasury bills was 13 percent. Money market mutual funds, on average, paid their holders 14.15 percent. This was only 10 basis points under the 90 day certificate of deposit rate and was nearly 100 basis points above the

Table 17

Interest Rates on Alternative Investments

	6-Month Treasury Bill	6-Month Certificate of Deposit	6-Month Eurodollar
1977:1	4.85	5.14	5.53
1977:2	5.06	5.47	5.87
1977:3	5.72	6.12	6.50
1977:4	6.41	6.95	7.41
1978:1	6.69	7.23	7.58
1978:2	6.97	7.82	8.27
1978:3	7.59	8.65	9.09
1978:4	9.03	10.76	11.59
1979:1	9.44	10.73	11.14
1979:2	9.36	10.25	10.69
1979:3	9.59	11.03	11.74
1979:4	11.68	13.74	14.60
1980:1	13.22	15.27	16.09
1980:2	10.00	11.30	12.05
1980:3	9.36	10.25	11.20
1980:4	13.32	15.15	15.95
1981:1	13.67	15.47	16.75
1981:2	14.24	16.29	17.26
1981:3	15.00	17.52	18.45
1981:4	12.34	13.81	14.70
1982:1	13.09	14.54	15.30
1982:2	12.46	14.28	15.10
1982:3	10.63	12.26	13.38

Source: Federal Reserve Bulletin.

rates paid on MMCs. The spread between what the funds paid and the quoted rate on CDs was narrower than the operating costs of the funds. Investment advisors bought other instruments such as Eurodollars as well as the liabilities of second tier banks and other firms at rates above the published certificate of deposit rates. Their spread was also aided because sales expanded in periods of rising markets. Based on their past experience, holders of money market mutual fund shares might well expect to secure yields of 10 to 25 basis points below the certificate of deposit rate and 50 to 75 basis points above the six-month Treasury bill auction rate.

The rates paid by the general run of funds is not, however, the entire picture. During 1982 households became more aware of financial risks, the fastest growing funds were those investing entirely in United States government securities or repurchases. By September 30, 1982, such funds held about 20 percent of the total. For the entire period 1980-82, these funds paid about 100 basis points less than the others. Their yields were only slightly above the six-month Treasury bill. In effect, their costs of operation were covered by the higher yields on repurchase agreements and agencies.

If the deposit institutions with their new accounts have to compete with MMMFs on a price basis, they would have to pay a rate somewhat above those paid on passbooks and checkable accounts. Under these conditions, it appears that the largest concentration of money would flow into the new accounts. What rate will be attractive to investors will

depend on the marketing ability of individual institutions, but it will also depend on the general competitive climate. To attract a high share of the money now in MMMFs, deposit institutions will have to convince investors of the advantages of their accounts and that they will pay competitive rates. This marketing will be in competition with their own passbooks and MMCs and with the desire of brokerage firms to retain control of the funds they now hold.

Money market mutual funds have not primarily sold their services to the individual investor. Only 31 percent of their assets are held by the funds dealing with individual households. About 20 percent are in funds catering to institutions. Almost half of the shares are sold through the MMMFs which primarily gather funds through accounts in brokerage firms. The amounts flowing to MMMFs from brokers and institutions are highly concentrated. Merrill Lynch alone is responsible for nearly 20 percent of the total while the top ten firms are responsible for about half of all the money in MMMFs. The deposit institutions will be able to compete for these funds directly from households. They also, however, will be able to pay fees to brokerage houses to entice them into putting their clients' money into the institutions rather than MMMFs.

Some of the amounts going through brokerage houses were undoubtedly attracted to the broker by the availability of money market instruments for extra cash and do not primarily arise from the brokerage business. Such sums do not differ greatly from those monies placed by households directly with the MMMFs. The ability and desires to quarantee high rates on money left with then will differ in importance among individual

brokerage firms depending on the joint profitability of specific accounts. The direct profits from managing or selling money market shares is only one part of an account's profitability. Such joint costs or returns will also affect the deposit institution's ability and desires to bid. Together they may result in even more uncertainty in financial markets as the new accounts are launched.

Another factor which the associations must consider is how a shift among their accounts may affect their liquidity and interest rate risk sensitivity, as the previous sections showed, the term of accounts has been falling. While funds placed in money market accounts have had a low turnover, they are in fact payable on demand. They are primarily interest sensitive funds. If funds flow into them from MMCs or larger time deposits, the amount of short-term liquid liabilities held by associations will increase. A larger percentage of payments will be dependent on the short-run movements in money market interest rates.

Thus the opportunity and the risks from adding a new type of deposit instrument are evident. Savings and loans and banks will be able to compete directly with the MMMFs, but they will also be competing for their own accounts and with each other. They should be able to attract a considerable share of the funds now being intermediated through the money market. A reduction will occur in this major source of money which has been flowing directly into the largest banks and other large financial

and industrial companies. This shift could cause a discernable impact on the rates the largest borrowers will have to pay and on the final uses of the funds.

But the regulatory unleasing of the mass of deposit institutions and their enhanced ability to compete for these funds may well be a mixed blessing. How much these additional funds will cost them will depend on their ability to market the new instruments at rates which will minimize the crossovers from their other accounts. If they cannot convince the public that safety and convenience make it worthwhile holding money market type funds in deposit institutions rather than in investment funds, their overall cost of funds and their interest rate sensitivity will jump.

The enactment of the Garn Bill was another giant step on the path to deregulation. It is fortunate that at least its initial influence will be felt in a period when the yield curve between short and intermediate maturities will once again be rising. But, as recent history makes only too clear, liability strategies based on only one particular shape of the yield curve can be extremely dangerous. In a constantly changing competitive environment with wide swings in interest rates, a sound borrowing and lending strategy for all rate structures and periods becomes even more necessary than in the past.

APPENDIX I

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]Kenneth T. Rosen and Larry Katz. "Money Market Mutual Funds: An Experiment in Ad Hoc DeRegulation: A Note," (forthcoming, Journal of Finance).

[2]The portion of this section focusing on the consumers' interest rate elasticity is taken from Rosen and Katz, Journal of Finance, forthcoming.

[3]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.

[4]The data code, Appendix 1, provides the full definition of and the source of each variable.

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

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lending by category would have come from MMMFs on the extreme assumption that each source contributes equally to each use.

Of course, this assumption is not accurate. Since banks have to watch their liquidity, their interest rate risks, and their diversification, their sources of funds influence to some extent the type of loans they make. Equally significant, one cannot tell from the results what would have happened if this major source of funds had not existed. These banks would have had to bid in other markets.

As one possible example, assume that instead of investing in MMMFs, individuals had placed their money in MMCs. If this had occurred, instead of $88 billion they obtained from the MMMFs, the largest banks would have received less than $16 billion in deposits. In this more widely diversified market for MMCs, smaller banks and S&Ls were able to compete far more effectively. The other gainers from the intermediation by MMMFs, namely, government securities, foreign money market assets, and commercial paper would also have experienced a reduction in direct demand. But this would not have been the final result. The large banks and those who borrowed from then would have increased their bids in the market and from other institutions. They would have bought some of the money which would have flowed initially to other institutions. Still, they would have had to pay more for their funds and would have borrowed less leaving more available for other borrowers.

While the general direction of how the growth of MMMFs impacted financial markets is clear, the data leave unresolved the issue of the ultimate impact. Table 10 contrasting the lending of those who obtained

the funds with those who did not obviously overstates the case just as does the opposite view that the final lending results did not differ because investors shifted among institutions and investments in response to extremely small interest differences. In this, as in similar cases, agreement on the degree of impact cannot be obtained. Observers view the data from different perspectives and arrive at quite divergent estimates of the results.

IV. Consumer Response to Money Market Mutual Funds[2]

This section deals with the influence of money funds on consumer interest rate elasticities, maturity preferences, and sensitivity to risk. We start with a theoretical formulation of a money fund model. We then econometrically test the interest rate elasticity impact of money funds and the introduction of the MMC. We also empirically demonstrate the shortening of maturities and the changing risk behavior of consumers.

A. Theoretical Specification of the Model

The basic foundation of a money market fund model is the theory of portfolio selection.[3] 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 and inversely related to the rates of return on competing assets. 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:

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

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. While our econometric model of money market fund shares follows this conventional treatment and assumes that both risk and liquidity differences between assets types are constant, an empirical section on changing consumer maturity and risk preferences is also included. However, our econometric model only captures 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 transaction 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) into (6) we obtain

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