

Money Market Mutual Funds: Investment Implications to Individual Investors in High Systematic Risk Periods

Aiwu Zhao, Skidmore College
Jonathan Zeidan, Kaiser Permanente

ABSTRACT

This paper investigates the risk structure differences of Money Market Mutual Funds (MMMFs) between the normal and abnormal economic periods in the hope of providing new evidence to help individual investors make better decisions in choosing MMMFs. Our research shows that the role of MMMFs in investment portfolios does demonstrate differences between the normal and abnormal economic periods. In normal economic periods, an increase in uncertainty of market situation would lead to more assets inflow to MMMFs, whereas in abnormal economic periods, an increase in uncertainty of market situation would lead to more assets outflows from MMMFs. In addition, MMMFs with durations over 40 days display a dramatic increase in asset flow volatility. Such evidence indicates that investors who choose MMMFs as a safe channel to park their money should avoid MMMFs with durations over 40 days, a number smaller than the 60 days criteria setup in SEC 2a7 regulations.

I. Introduction

Since Money Market Mutual Funds (MMMFs) have often be considered as a safe place to park money and played a role of risk-free assets in portfolio management for investors, the heterogeneity among various MMMFs has not been paid enough attention in past literature. During the economic downturn of 2008, MMMFs experienced industry-wide withdrawals. Yet it is not clear whether the withdrawals happened homogenously across all categories of MMMFs or more among certain categories of MMMFs. A study on the withdrawals from MMMFs during abnormal economic period would provide evidence to help risk-averse investors make more educated decision on investing in MMMFs, more specifically if significant heterogeneity among MMMFs has been identified, then it is suggested that risk-averse investors shall be caution when picking up MMMFs in their portfolio.

During the financial crisis of 2008, Money Market Mutual Funds (MMMFs) experienced huge net outflows, adding risk to the already turbulent financial markets. Faced with unprecedented demands for redemption, MMMFs sold assets at the equivalent of fire sale prices. Not fully appreciating the fact that money market mutual funds can, and do in fact, lose value, investors lost confidence in these funds, as well as in other financial instruments. Markets were in great turmoil; the stock market lost a significant portion of its value. During this great crisis of confidence, the Securities and Exchange Commission (SEC) intervened to stem the fears of the investing public and reduce the demand for MMMF redemptions. This resulted in a relative stabilization of the MMMF industry. Despite this relative stabilization, its reflection on MMMFs increased the need for the American investor to better understand the MMMFs.

Past literature (Domian and Reichenstein, 1997) on MMMFs is limited to a relative less volatile market situation. We argue that before the financial crisis of 2008, MMMFs have been considered an investment vehicle to park the money safely. Not much attention has been paid on the risk exposure of MMMFs and how sensitive they are to the market and credit risks. After the crisis, it becomes evident that it is necessary to monitor the risk exposure of MMMFs as well. The volatile market environment provides an opportunity to examine the risk-return feature of MMMFs in a more comprehensive way. The research result will provide more evidence on the investment behavior of investors on relatively low risk assets. The findings will provide useful information to help financial advisors allocate their clients' money.

The paper is organized as follows. Next two sections provide a discussion on the risk structure of MMMFs. Section four presents the methodologies and discusses the test results. The final section concludes the paper.

II. An Overview on Money Market Mutual Fund Industry

MMMFs provide investors a low risk way to receive the benefits of pooled investing. Usually perceived low-risk investments, MMMFs are classified into three distinct market segments: Prime MMMFs, Government MMMFs, and Tax Free MMMFs.

Government Money Market Mutual Funds and Tax-Free Money Market Mutual Funds are typically considered to be the more secure MMMF investments than Prime MMMFs. Government MMMF portfolios are limited to holding obligations of the United States government, including those of the U.S. treasury and other federal agencies. Tax-Free MMMFs usually hold obligations of individual states or municipalities and have the advantage of being exempt from federal taxes.

Prime Money Market Mutual Funds invest mainly in debt instruments such as commercial paper, certificates of deposit, and variable rate demand notes. Compared to Government and Tax-Free MMMFs, Prime MMMFs typically offer the highest yield and generally have the most Assets Under Management (AUM). As of January 1st, 2011, Prime MMMFs held \$1.79 Trillion dollars in AUM, representing 55% of the entire money market mutual fund industry (imoney.net data, 2011).

MMMFs in the U.S. are required to have a rounded Net-Asset-Value (NAV) of \$1.00 per share. The NAV is calculated by dividing the total value of the fund's portfolio, less its liabilities, by the total number of shares outstanding (Investopedia, 2011). The NAV remains a steady \$1.00 per share, despite gains and losses in the fund, by adjusting the number of shares held by investors. When a fund's assets increase in value, investors receive a corresponding adjustment in their number of shares, allowing the NAV to remain at \$1.00. In contrast, if an investor redeems her shares, the decrease in the number of shares in the fund is matched by an equivalent

decrease in assets held by the fund (as her shares are redeemed at \$1.00 per share), resulting in a NAV of \$1.00 per share. It is important to note, however, that the NAV is rounded to the nearest cent and thus may fall as far as .995 before the fund ‘breaks the buck.’ When a fund ‘breaks the buck’ it means the fund’s NAV has fallen below \$1.00. In the history of MMMFs, a fund has ‘broken the buck’ on only two occasions: The Putnam fund and the Reserve Primary fund, both during the financial crisis in September of 2008. When the NAV fell below \$1.00, investors’ concerns and fears lead them to demand redemptions and seek more secure investments, resulting in net outflows from MMMFs.

Despite its perceived safety, MMMFs are inherently susceptible to runs. MMMF investments are structured to allow for instantaneous purchase or redemption from the fund. When a large number of investors seek to redeem their MMMF investments, suddenly and simultaneously, it is nearly impossible for the fund to meet all redemptions. Furthermore, MMMFs are not insured nor are fund sponsors formally obligated to support the funds in an emergency. Consequently, if a fund is ‘breaking the buck’, there is an incentive for investors to redeem ahead of their peer investors, as the fund may not be able to meet all investor redemptions.

The structural shortcomings of Money Market Mutual Funds are compounded by investor culture. The NAV promotes a false sense of security to investors. Since the NAV is rounded and investors do not see regular gains and losses on their investments, money market mutual funds are often mistakenly considered to be risk free. Moreover, as MMMFs are not high yield investment vehicles, they appeal to risk-averse investors who may be sensitive to the slightest chance of a negative market event. MMMF investors redeem and move their money into more secure investments when there is any indication of trouble in the MMMF industry. When Federal

Reserve Bank of Boston President Eric Rosengren gave a speech at Stanford citing MMMFs as a source of financial instability on June 3, 2011, Prime MMMF AUM decreased by over \$4 billion (3% of total AUM) during the following two weeks. Furthermore, when the Wall Street Journal published “Money Market Mayhem” on June 27, 2011, an article highlighting MMMF exposure to struggling European nations, Prime Money Market Mutual Fund AUM fell by 2%, or \$2.5 billion, in one week. Lastly, when the Financial Stability Oversight Committee (FSOC) released its report on July 26, 2011, in which MMMFs were identified as an area of concern, Prime MMMF AUM decreased by \$5.4 billion, representing over 4% of total Prime AUM (imoney.net data). As supported in the aforementioned examples, the success of money market mutual funds is significantly dependent upon the actions of investors, who tend to be conservative but frequently respond abruptly (via redemptions) when concerned about the safety of their investments.

III. Money Market Mutual Funds in the Global Financial Crisis

Despite the structural instability of Money Market Mutual Funds, as of August 2008, Assets Under Management totaled \$3.5 trillion dollars and the Weighted Average Yield for all MMMFs (WAY) was over 2% (imoney.net Data). However, when Lehman Brothers failed on September 15, 2008, investors were concerned about the Reserve Primary Fund, which held significant exposure to Lehman Brothers. Not surprisingly, investors redeemed shares in massive and sudden fashion. Over a four-day period, from September 15-19, 2008, Prime Money Market Mutual Funds lost over \$300 billion dollars in AUM (imoney.net Data). As a result, MMMFs were forced to sell assets in an attempt to meet abrupt demand for redemptions. However,

investors were not only withdrawing money from Prime Money Market Mutual Funds, they were moving their investments into Government funds: a flight to quality (Agapova, 2011).

Unfortunately, some assets proved more difficult to sell as investors demanded a higher return for what was perceived as a higher risk investment. The spreads on Asset-Backed Commercial Paper (ABCP) increased significantly and investors shunned longer-term securities due to market valuation risk. This resulted in ABCP to be issued only in overnight maturities, and the resulting effects on the short-term credit market were severe. Businesses across many industries, which traditionally relied on short-term funding from MMMFs, suffered from this lack of liquidity.

On January 27, 2010, the SEC passed 2a7, an amendment to the Investment Act of 1940 that addressed many of the MMMF industry structural deficiencies (Agapova, 2011). In an effort to address concerns over a fund's ability to meet sudden redemption requests, SEC 2a7 regulations mandate that a MMMF maintain a daily liquidity position of 10%, and a weekly liquidity position of 30%. These restrictions are intended to provide MMMFs a liquidity cushion large enough to avoid the forced selling of assets in unfavorable markets. The SEC intervention resulted in improvement of MMMF portfolios by stipulating that a taxable MMMF may not invest more than 3% of its portfolio in second-tier securities or hold a single second-tier security exposure larger than 0.5%. These regulatory changes are expected to reduce the likelihood that a fund would break the buck because of a single credit event. Furthermore, in an effort to address interest rate risk, the SEC amended certain regulations regarding portfolio maturity. Specifically, a portfolio may not have a Weighted Average Maturity (WAM) over 60 days, increasing the previous WAM restrictions of 90 days. Another noteworthy change by the SEC specifies that advisors must periodically stress test their respective MMMFs to determine whether the fund

‘breaks the buck’ under various hypothetical conditions. The SEC also adopted a rule change now permitting MMMFs at risk of ‘breaking the buck’ to suspend redemptions until the fund can liquidate its portfolio in an orderly manner, thus avoiding the risk of further depressing market valuations through untimely liquidation at fire sale prices. The latter rule change, the ability for MMMFs to suspend redemptions, is arguably the most important amendment in addressing MMMF instability.

Consequent to the events of 2008, MMMF problems are no longer overlooked. Currently, money market mutual funds are frequently scrutinized because of their large exposures to struggling European nations. Further reform to the MMMF industry is foreseeable and a number of viable policy changes are already being considered, including: conversion of a stable NAV to a floating NAV, the establishment of an emergency liquidity facility, insurance on MMMFs, or the creation of a two-tier system (Report from the President’s Working Group, 2010).

This paper analyzes how fund performance and investor activities change with respect to factors in two major groups, fund specific factors and industry wide factors, to provide empirical evidence to support possible regulatory proposals.

IV. Empirical Tests

From January 1, 2007 to January 1, 2010, the United States economy experienced booming economic growth, suffered its worst recession in the last eighty years, and entered a period of very slow economic recovery. Three distinct time segments are tested during this 36-month period, and the fund-specific as well as industry wide factors’ effect on Prime Money Market Mutual Fund Assets Under Management (AUM) are analyzed.

The Data used in this study were retrieved from imoney.net.com. The following table describes the independent variables that may influence the size of AUM as they appear in the following five-regression models. These six variables can be divided into three groups. First group includes factors that influence the risk level of a specific fund, Weighted Average Maturity in days (wam) and percentage of holding that is maturing in 7 days (matin7days). The “wam” is expected to have positive relationship with AUM whereas “matin7days” is expected to have a negative relationship with AUM, because the higher the maturity, the higher the risk, and correspondingly the higher the expected return of the fund. As a consequence, higher expected return is expected to attract more assets in-flows. The second group of factors are those that influence the risk of MMMFs at the industry level. VIX, the Chicago Board Options Exchange (CBOE) Volatility Index, is the widely used proxy to reflect the uncertainty of the overall market. Treasury Eurodollar Spread (TEDspread), calculated as the spread between Eurodollar and T-bill, is variable usually used to reflect credit risk level in financial markets. The last group variables are fund performance variables. We include Fund Management Fee (mgtfee) and Simple Daily Yield (daynet). It is expected that the higher the return, or Simple Daily Yield (daynet), and the lower the Fund Management Fee (mgtfee), the more likely the fund will attract more assets in-flows. The correlations among the variables are shown in Table 1.

Variable Name	Explanation
mgtfee	Fund Management Fee
daynet	Simple Daily Yield
wam	Weighted Average Maturity (in days)
matin7days	percentage of holding maturing in 7 days
VIX	Chicago Board Options Exchange (CBOE) Volatility Index
TEDspread	Treasury Eurodollar Spread

Table 1: Correlation among variables

	AUM	mgtfee	daynet	wam	matin7days	VIX	TEDspread
AUM	1	-0.15891	0.0184	0.11491	-0.0696	0.00213	-0.00198
		<i><.0001</i>	<i>0.0035</i>	<i><.0001</i>	<i><.0001</i>	<i>0.7355</i>	<i>0.7528</i>
mgtfee		1	-0.04299	0.08418	-0.06252	-0.01855	-0.01572
			<i><.0001</i>	<i><.0001</i>	<i><.0001</i>	<i>0.0032</i>	<i>0.0126</i>
daynet			1	-0.0981	0.03624	-0.40006	-0.08022
				<i><.0001</i>	<i><.0001</i>	<i><.0001</i>	<i><.0001</i>
wam				1	-0.46443	-0.07925	-0.13388
					<i><.0001</i>	<i><.0001</i>	<i><.0001</i>
matin7days					1	0.01722	0.0352
						<i>0.0063</i>	<i><.0001</i>
VIX						1	0.71801
							<i><.0001</i>
TEDspread							1

We then use panel data to identify which factors among the six independent variables are significant in relationship to Prime Money Market Mutual Fund Assets Under Management (AUM) through the whole study period (Table 2). The test result shows that every factor except “TEDspread” in the model is statistically significant. The signs of the coefficients are as expected as well.

Management fees (mgtfee) contribute negatively to AUM, that is, the higher a fund’s expense ratio is, the less investment money the fund is likely to attract. Daily Simple Yields (daynet) contribute positively to AUM, meaning when investors receive a higher return on their money from a fund, they are more likely to invest with that fund. Weighted Average Maturity (wam), a measure of a fund’s risk appetite, positively affects AUM. As a fund takes on more risk, by increasing “wam”, AUM rises. The percent of securities maturing in 7 days (matin7days) operates consistently with the “wam”. That is, as the percent of securities maturing in 7 days decreases, “wam” increases accordingly. Therefore, the negative significant influence of “matin7days” is consistent with the findings related to “wam”. A rising VIX indicates a more volatile market. As demonstrated in Table 2, VIX is positive significant, indicating as the market

becomes more volatile, investors will shift assets into MMMFs. This reflects the general perception on MMMF as safe investment vehicle. The full model does not indicate any significant influence from TEDspread. This can be explained by the high correlation, with a $\rho=0.718$, between VIX and TEDspread as shown in the correlation table (Table 1). Due to the high correlation among the two factors, there might be multicollinearity problem existed. So in the following tests, we separate the two market factors to test their explanatory power individually.

Table 2: Full model GLS regression based on the whole study period

Variable	Coef.	Std. Err.	z value	Pr > z
intercept	1076.40***	352.70	3.05	0.002
mgtfec	-9565.80***	352.05	-27.17	0.000
daynet	149.10***	30.53	4.88	0.000
wam	77.76***	4.49	17.30	0.000
matin7days	-1232.28***	371.94	-3.31	0.001
VIX	19.15**	7.55	2.54	0.011
TEDspread	-21.93	84.75	-0.26	0.796
N	25012			
Rsq	0.043			

***Significant at 0.01% level; **Significant at 0.05% level; *Significant at 0.1% level.

Since there was a dramatic out flow of assets in Prime MMMFs during the period of economic downturn between July 2008 and June 2009, we then divide the dataset into two subsets, one covers the period from July 2008 to June 2009 to reflect the assets flow in abnormal economic situation; and the other covers other months, including the periods from January 2007 to June 2008 and then from July 2009 to January 2010 to reflect the assets flow in normal period.

Tables 3A and Table 3B show the results during normal period. We include only one of the two macro factors, VIX or TEDspread, in each test to separately examine the contributions of market volatility and credit risk.

As can be seen, the performance factors and fund level risk factors still demonstrate similar influences to assets flow as shown in the pooled dataset. For the market factors, when only TEDspread is included, the test results reveal that TEDspread is not significant with a p -value of 0.11, indicating that AUM of Prime MMMFs is not very sensitive to the changes of TEDspread during normal economic periods. On the other hand, AUM is highly sensitive to the changes of VIX during these periods.

Table 3A: GLS regression during normal periods with VIX dropped in model

Variable	Coef.	Std. Err.	z value	Pr > z
intercept	1343.25***	378.68	3.55	0.000
mgtfee	-9375.43***	408.14	-22.97	0.000
daynet	115.42***	32.01	3.61	0.000
wam	76.27***	5.62	13.57	0.000
matin7days	-1044.91**	452.54	-2.31	0.021
TEDspread	166.41	104.26	1.60	0.110
N	16971			
Rsqu	0.042			

***Significant at 0.01% level; **Significant at 0.05% level; *Significant at 0.1% level.

Table 3B: GLS regression during normal periods with TEDspread dropped in model

Variable	Coef.	Std. Err.	z value	Pr > z
intercept	293.25	525.71	0.56	0.577
mgtfee	-9330.70***	408.31	-22.85	0.000
daynet	168.18***	34.53	4.87	0.000
wam	75.81***	5.61	13.50	0.000
matin7days	-1076.91**	452.20	-2.38	0.017
VIX	49.02***	15.40	3.18	0.001
N	16971			
Rsqu	0.042			

***Significant at 0.01% level; **Significant at 0.05% level; *Significant at 0.1% level.

Tables 4A and 4B show the results for the period of economic downturn. It can be seen that both VIX and TEDspread demonstrate significant negative contribution to AUM, indicating that during the abnormal market period, investors will redeem more shares from MMMFs when there is an increase in volatility of the market and credit risk, a phenomenon that is opposite to what happens during normal economic periods.

Table 4A: GLS regression during abnormal periods with VIX dropped in model

Variable	Coef.	Std. Err.	z value	Pr > z
intercept	2150.20***	524.21	4.1	0.000
mgtfee	-9191.69***	691.51	-13.29	0.000
daynet	954.17***	140.54	6.79	0.000
wam	72.94***	7.60	9.50	0.000
matin7days	-1276.30*	653.89	-1.95	0.051
TEDspread	-472.49***	117.09	-4.04	0.000
N	8041			
Rsquared	0.050			

***Significant at 0.01% level; **Significant at 0.05% level; *Significant at 0.1% level

Table 4B: GLS regression during abnormal periods with TEDspread dropped in model

Variable	Coef.	Std. Err.	z value	Pr > z
intercept	3422.87***	652.16	5.25	0.000
mgtfee	-9109.95***	692.02	-13.16	0.000
daynet	1054.97***	146.88	7.18	0.000
wam	72.12***	7.63	9.45	0.000
matin7days	-1309.82**	653.43	-2.00	0.045
VIX	-56.41***	12.11	-4.66	0.000
N	8041			
Rsquared	0.051			

***Significant at 0.01% level; **Significant at 0.05% level; *Significant at 0.1% level

The above results demonstrate that the role of MMMFs in portfolio managements changes with the external market situations. More specifically, both VIX and TEDspread have

very close negative relationship with the asset flows of MMMFs during abnormal economic downturn, while during normal economic periods, VIX has significant positive impact to asset flows and TEDspread does not demonstrate significant relationship with asset flows. Since MMMFs are considered to be safer investment vehicles, an increase in asset in-flows to MMMFs due to the increase of market volatility during normal economic periods is an action that is consistent with the role played by risk-free assets in portfolio management. Whereas in abnormal economic periods, the risk of MMMFs increases with the increases in systematic risk, indicating MMMF investments cannot play the role of risk-free assets in portfolio management any more. In order to sustain MMMFs' role of risk-free investments in portfolio management without the interference from the major changes in systematic risk, a hedging strategy related to TEDspread can be applied by investors with sizable assets to manage. Our test results indicate that between the two market variables, VIX and TEDspread, TEDspread is a better index to hedge because asset flows are only sensitive to TEDspread during abnormal periods and not sensitive during normal periods. More specifically, since TEDspread is the spread between T-bill and Eurodollar, investors can long T-bill and short Eurodollar futures contracts in the hedging strategy. As a result, when credit risk increases during abnormal economic downturn, money flows out of money markets and MMMFs decreases in value. This outflow and value decrease will be offset by the increases in value in TEDspread hedging.

In order to provide evidence to help individual investors with smaller scale assets to manage choose MMMFs, next we further examine the relationship between fund maturity and AUM in depth. Figures 1 and 2 plot Weighted Average Maturity, measured in days, against changes in Money Market Mutual Fund Assets Under Management. While not conclusive, a cursory analysis of the plots indicate that AUM, and in turn investor behavior, is significantly

more volatile when WAM increases over 40 days and this change is more dramatic during abnormal economic periods.

Figure 1: AUM change vs. Weighted Average Maturity in normal periods

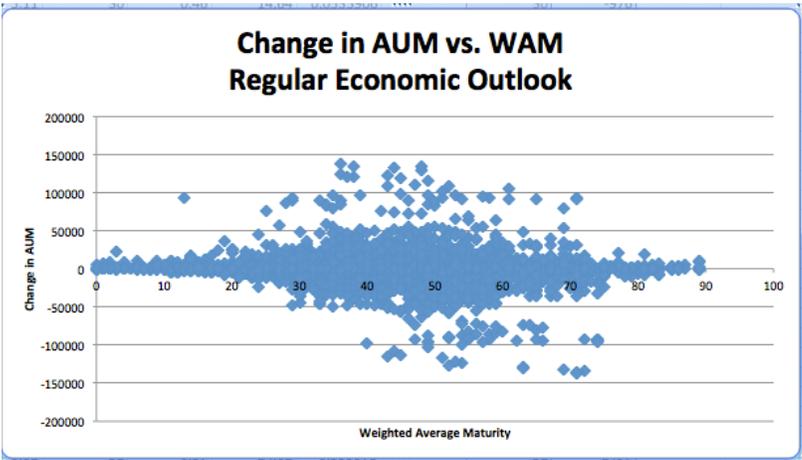
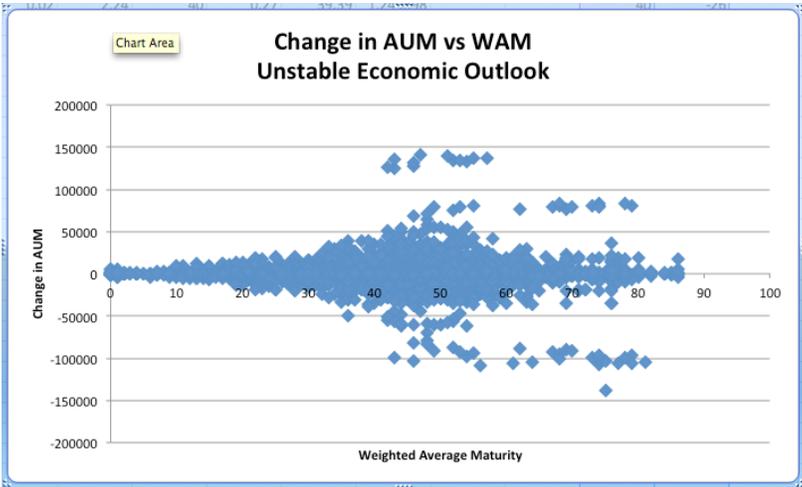


Figure 2: AUM change vs. Weighted Average Maturity in abnormal downturn periods



The plots indicate that individual fund level of volatility can experience a dramatic change when the Weighted Average Maturity of the fund reaches 42 days. The specific reason that causes this phenomenon deserves further investigation. However, we can tell from this result that if a fund-level risk monitoring process is to be employed, Weighted Average Maturity around 40 days can be the cut-off point for stricter monitoring actions. As a result, investors who

choose MMMFs as a safe channel to park their money should avoid MMMFs with durations over 40 days, a number smaller than the 60 days criteria setup in SEC 2a7 regulations.

V. Conclusion and Further Inquiry

The Money Market Mutual Fund industry is not as safe as regulating agencies and the investing public perceives it to be. This paper examines and identifies investment recommendations for individual investors to mitigate the risk of MMMFs in high systematic risk scenarios. More specifically, we find in normal economic periods, an increase in uncertainty of market situation would lead to more assets inflow to MMMFs, whereas in abnormal economic periods, an increase in uncertainty of market situation would lead to more assets outflows from MMMFs. This phenomenon leads to a hedging strategy recommendation to investors with sizable assets to manage. By longing T-bill and shorting Eurodollar, investors can sustain MMMFs' role as a risk-free investment during high systematic risk market periods. We also find that MMMFs with durations over 40 days display a dramatic increase in asset flow volatility. Such evidence indicates that investors who choose MMMFs as a safe channel to park their money should avoid MMMFs with durations over 40 days, a number smaller than the 60 days criteria setup in SEC 2a7 regulations.

Despite the significance of the findings of this study, there remains considerable opportunity for further research. As illustrated in previous sections, individual fund level analysis indicates that as the Weighted Average Maturity increases to over 40 days, MMMF Assets Under Management became much more volatile. However, this observation is not sufficient for identifying the underlying reasons cause the phenomenon. Developing a clear understanding of causes is necessary to support a more solid strategy. While the analysis of this paper identifies a

very important phenomenon for individual investors in choosing MMMFs, it does not address the interconnectedness of factors, which highlights the gaps where further research is needed

Reference

Agapova, A. (2011). The Role of Money Market Mutual Funds in Mutual Fund Families. *Journal of Applied Finance*, 21(1), 87-102.

Gascon, C., & Anderson, R. (2009). The commercial paper market, the Fed, and the 2007-2009 financial crisis. *Federal Reserve Bank of St. Louis*, 589-612.

Collins, S., & Mack, P. (1994). Avoiding runs in money market mutual funds: have regulatory reforms reduced the potential for a crash? *Board of Governors of the Federal Reserve System (U.S.) in its series Finance and Economics Discussion Series*, (94-14).

Domian, Dale L, and William Reichenstein. (1997). Performance and Persistence in Money Market Fund Returns, *Financial Service Review*, 6(3), 169-183.

Duygan-Bump B, Parkinson P, Rosengren E, Suarez G, Willen P. (2010) How effective were the Federal Reserve emergency liquidity facilities?: evidence from the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility. *Federal Reserve Bank of Chicago*.

Gorton, Gary, and Andrew Metrick. Regulating the Shadow Banking System. *Brookings Papers On Economic Activity* 2 (2010): 261-312.

Mansur, Iqbal, Babatunde Odusami, and Alireza Nasseh. The Relationship between Money Market Mutual Fund Maturity And Interest Rates. *Journal of Financial Service Professionals* 65.4 (2011): 58-66.

Miles, W. (2001). Can Money Market Mutual Funds Provide Sufficient Liquidity to Replace Deposit Insurance? *Journal of Economics & Finance*, 25(3), 328.