Investor Flows, Monetary Policy, and Portfolio Management of Money Market Funds[†]

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First Draft: November 2023

This Draft: November 2023

Abstract

This study investigates how money market funds (MMFs), a $6 trillion industry, adjust portfolio strategies in response to investor flows and monetary policy changes. We show that increased flows lead MMFs to subsequently increase credit risk exposures, lengthen durations, and lower liquidity reserves. For monetary policy rates, a key influence on MMFs, we find that both higher prevailing policy rates and anticipation of rate cuts prompt risk-taking, duration-extension, and liquidity-reduction behaviors among MMFs. Moreover, we document that under certain monetary policy conditions, prime funds, susceptible to investor runs, exhibit distinct strategies from government funds: In ultralow rate environments, prime MMFs invest conservatively to stay safe and liquid, whereas government MMFs lengthen durations to earn positive net yields to stay afloat; amid rising monetary policy uncertainty, prime funds reduce risks and increase liquidity, while government funds, often perceived as safe heaven, shift towards longer-term securities to earn term premium.

Keywords: Investor flow, monetary policy, money market fund (MMF), credit risk, interest rate risk, and liquidity management,

JEL Classification: G11, G20, G23, G28

[†] The views expressed herein are those of the authors and do not necessarily reflect those of the Federal Reserve Board or its staff. All errors are our own.

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1. Introduction

Asset managers attentively manage portfolio risk exposures and liquidity conditions when making investment decisions, aiming to maximize profits while preparing for potential investor redemptions. This study explores the critical factors driving these investment decisions through the lens of money market funds (MMFs). Managing about $6 trillion assets, MMFs play a significant role in the economy.[1] They serve as effective cash-management tools for individuals and institutions, aiming to safeguard principal and ensure liquidity upon requests. In addition, MMFs are a critical source of short-term funding for major banks and non-financial corporations.[2] Furthermore, MMFs play a vital role in the effective transmission of monetary policy, as they primarily invest in assets with maturities of up to a year and their yields closely track monetary policy rates.

Despite their relatively safe and short-term investments, MMFs can pose significant risks to financial stability due to their vulnerability to investor runs. Investors typically seek MMFs for their safe and liquid investments, with a very low tolerance for asset value loss. A slight drop below the $1 net asset value, known as "breaking the buck", can prompt widespread investor runs, a scenario evident in the 2008 financial crisis with the Reserve Prime Fund. Moreover, the market liquidity of MMF assets such as commercial paper can quickly vanish in times of stress. This could exacerbate investor concerns and amplify run risks, potentially leading to disruptions in short-term funding markets and shortage of credit supplies.

Faced with these unique challenges stemming from the nature of their assets and the inherent susceptibility to investor runs, MMFs must adeptly manage portfolio risk exposures and liquidity buffers. In this study, we highlight two primary factors influencing MMF portfolio decisions: investor flows and monetary policy rates. Investor flows shape the stability and structure of MMFs' liabilities, while monetary policy rates significantly impact the valuation of MMF assets.

[1] Based on SEC N-MFP data as of September 2023, among the $6 trillion assets held by MMFs, government MMFs hold $4.8 trillion, prime funds account for about $1.3 trillion, and tax-exempt MMFs encompass around $0.1 trillion. For context, compared to other investment vehicles reported by Investment Company Institute as of September 2023, U.S. equity mutual funds manage approximately $9 trillion in assets and bond funds manage close to $4.5 trillion.

[2] Based on Financial Accounts of the United States (Z.1) published by the Federal Reserve Board, MMFs provide about half of the funding in the repurchase agreement (repo) market, and supply about 20 percent of funding in the commercial paper market where corporations obtain funding for short-term financial needs, such as operation costs and inventory management.

Managing the two sets of factors encapsulates the primary functions of MMFs as financial intermediaries: monitoring funding sources (i.e., investor flows), and allocating funds into yield-bearing assets influenced by monetary policy rates.

Our study examines the effects of investor flows and monetary policy on three pivotal aspects of MMF investment decisions: credit risk, portfolio duration, and liquidity management.[3] We employ two measures for each aspect to enrich our understanding. For credit risk in prime MMFs, we assess the share of risky assets and the concentration level of these assets. Portfolio duration is analyzed through weighted average maturity (WAM) and weighted average life (WAL), both reflecting different methodologies for calculating the maturities of securities within an MMF's portfolio. Liquidity levels are gauged based on the proportion of assets maturing within a week and the share of flexible assets, defined as those easily adjustable throughout the day to accommodate redemption requests and inflow surges. Our analysis, spanning from January 2009 to February 2023, utilizes the comprehensive, high-frequency data provided by iMoneyNet, a prominent data source for MMFs.

Our main findings are summarized as follows. First, we study the impact of investor flows on MMFs' portfolio management. Specifically, we employ panel regression analysis to estimate how weekly changes in portfolio measures of funds relate to previous week's investor flows, examining prime and government funds separately. Our main results are statistically significant, economically large, and robust to various controls.

In the realm of credit risk management, our analysis indicates that prime MMFs tend to increase their credit risk in response to inflows from the preceding week. A one-standard-deviation increase in lagged flows leads to a 0.5-percentage-point uptick in the allocation to riskier assets, representing 12% of its standard deviation, and a 0.4-percentage-point rise in risk concentration, corresponding to 11% of its standard deviation. Regarding portfolio duration management, we observe that investor inflows encourage MMFs to extend their portfolios duration, whereas outflows induce a contraction in duration. A one-standard-deviation increase in lagged flows is associated with a 0.6-day and a 0.5-day lengthening in prime fund's WAL and WAM, respectively, and a 0.8-day increase in WAL and a 0.5-day increase in WAM for government funds. Regarding

[3] To assess credit risk management, we exclusively concentrate on prime MMFs as government MMFs, by regulations, can only hold government securities and associated repos; to evaluate duration and liquidity management, we undertake separate studies for both prime and government MMFs.

liquidity management, we find that MMFs typically diminish their holdings of liquid and readily adjustable assets following recent inflows, and conversely increase their liquidity reserves in response to outflows. A one-standard-deviation hike in lagged flows results in a 0.6-percentage-point reduction in both the allocation to maturing-in-7-day and flexible assets for prime funds, and a 0.4-percentage-point and a 0.2-percentage-point decrease in these respective measures for government funds.

We also delve into whether the impact of investor flows on MMF portfolio management is predominantly driven by inflows or outflows, a critical aspect from the standpoint of financial stability. For instance, if our findings primarily reflect a tendency for MMFs to increase risk and reduce liquidity during inflows, it may raise concerns about financial instability. Our regression analyses reveal that both inflows and outflows significantly affect MMF portfolio management, with a slightly more pronounced effect from inflows.

In addition, our findings indicate similar impact stemming from longer-term flows on MMF portfolio as from the weekly flows, consistent with fund manager's reactions to flows likely driven by MMF longer-term investment strategies. Furthermore, our robustness checks show that the flow impact on MMF portfolio persists across subsamples differentiated by fund size, fee level, past performance, fund age, and institutional ownership, and is prevalent both before and after the 2016 SEC reform on MMFs.[4]

Our next main set of analyses focuses on how monetary policy influences MMF portfolio management. Monetary policy rates are crucial in determining MMFs' asset valuations and their overall performance, because MMFs are mandated to invest in short-term securities with a maturity of fewer than 397 days. As such, MMF performance is predominantly driven by policy rates, which explain about 90% of the MMF yield movements. Additionally, we note a strong correlation between policy rate levels and the dispersion of fund performance, indicating more room for MMFs to distinguish themselves from each other in a higher rate environment. These underscore the propensity of MMFs to closely monitor policy rate movements and adjust their portfolios accordingly.

To capture the multifaceted impact of monetary policy rate on MMF portfolio management, we develop four measures: the current level of policy rates, an indicator for ultralow rate regimes,

[4] In October 2016, the Securities and Exchange Commission (SEC) implemented reforms on MMFs with the aim to enhance stability and minimize investor run risks.

and two forward-looking measures—expected policy rate change, defined as the expected one-quarter ahead federal funds rate minus the current level, and monetary policy uncertainty, calculated as the implied volatility of one-quarter ahead federal funds rate. In examining the impact of these factors on MMF portfolio management, we conduct panel regressions while controlling for fund characteristics, market-wide variables, and fund-fixed effects.

For the impact of policy rates on portfolio strategies, we find that MMFs typically increase credit risk, lengthen portfolio duration, and lower liquidity in response to rising policy rates. Specifically, for prime funds, a one-percentage-point rise in policy rate corresponds to a 0.9-percentage-point increase in risky asset allocation, a 0.6-percentage-point rise in risk concentration, a 1.5-day and 0.3-day extension in WAL and WAM, respectively, and a one-percentage-point decline in liquid asset allocation. Similar patterns are observed for government funds. Intuitively, a higher monetary policy rate environment presents more profit opportunities and greater variations in performance for MMFs, possibly driving managers to adopt riskier and less liquid investment strategies.

Regarding the effect of shifting to an ultralow rate environment, we show that prime MMFs adopt a more cautious investment approach, decreasing risk and boosting liquidity, while government MMFs extend their portfolio duration. Specifically, when transitioning to an ultralow rate regime, prime funds show a 0.5-percentage-point reduction in risky asset allocation, a 0.3-percentage-point drop in risk concentration, a 1.1 (0.2) day decrease in WAL (WAM), and a 0.6 to 0.8-percentage-point decrease in liquid asset shares, whereas government funds extend their WAL (WAM) by 0.2 (0.1) day. To understand the contrast in portfolio strategies between prime and government funds, we note that, in ultralow rate periods, prime fund's incentives to outperform other prime funds are low due to the challenge of distinguishing between slight performance differences; instead, their top priority is to remain secure and liquid. Government funds, in that situation, squarely focus on generating positive returns after fees to retain investors, as their holdings, predominantly government securities and associated repos, offer minimal yields in an ultralow rate environment. As such, government funds seek longer durations to stay afloat in an ultralow rate environment.

Concerning the effect of expected rate changes, MMFs generally shorten portfolio durations and augment liquidity in anticipation of rate hikes, while they lengthen durations and reduce liquidity when expecting rate cuts. For prime funds, a one-percentage-point increase in expected

rate change is linked to a 0.5 (0.4)-day reduction in WAL (WAM) and a 0.3-percentage-point rise in liquid asset allocation. Similar patterns are observed for government funds. This strategy enables funds to better position themselves for future rate hikes with more liquid portfolios, and to prepare for rate cuts by locking in longer-term assets to leverage on the prevailing high interest rates.

For the ramifications of monetary policy uncertainty, we observe distinct responses between prime and government MMFs. Prime funds, prone to investor runs in times of stress, tend to lower risk and accumulate liquidity amid rising uncertainty, whereas government funds, with little run risks and often viewed as safe heaven, lean towards longer-term securities. Specifically, for prime funds, a one-percentage-point increase in policy uncertainty is associated with a 0.5-percentage-point reduction in risky asset allocation, a 0.3-percentage-point decline in risk concentration, a 0.3-day decrease in WAL, and a 0.3-percentage-point increase in flexible asset allocation. This indicates a cautious approach by prime funds. Conversely, for government funds, a one-percentage-point increase in policy uncertainty appears to prompt them to extend WAL (WAM) by 0.3 day, and to reduce liquidity buffers by 0.1- to 0.2-percentage point. These distinct investment strategies likely reflect government funds' incentives to seize the opportunity amidst heightened monetary uncertainties, and to earn term premiums by titling their holdings towards longer-term government securities.

Lastly, we evaluate whether the impact of monetary policy on MMFs' portfolio management persists over an extended period. By examining portfolio changes over a range of timeframes – weekly, monthly, and quarterly – we observe that the impacts of our monetary policy variables remain consistently significant. This consistency underscores the robustness of our findings regarding the effects of monetary policy on MMF portfolio management.

The remainder of this paper is structured as follows. Section 2 highlights our key contributions to the existing literature. Section 3 provides a detailed description of our data sources, explains how we construct MMF portfolio measures, and present summary statistics. Section 4 examines how fund managers adjust their portfolios in response to investor flows. Section 5 analyzes the impact of monetary policy rates on MMF portfolio management. Section 6 concludes.

2. Literature

Our paper makes unique contributions to several strands of literature. First, we expand and deepen the understanding on the intricate interactions between MMF managers and investors. Prior studies in this literature typically focus on how pre-crisis portfolio attributes influence investor redemptions at times of crises. For instance, McCabe (2010), McCabe et al. (2013), Kacperczyk and Schnabl (2013), Strahan and Tanyeri (2015), and Schmidt, Timmermann, and Wermers (2016) consider the 2007-2009 financial crisis, discovering that MMFs holding riskier pre-crisis portfolios tend to face more severe investor runs during the crisis, particularly from sophisticated investors. Chernenko and Sunderam (2014), Ivashina, Scharfstein, and Stein (2015), and Gallagher, Schmidt, Timmermann, and Wermers (2020) direct their attention to the 2011 Eurozone sovereign debt crisis, revealing that MMFs with higher exposures to Eurozone debt experience more redemptions during crisis time, and subsequently reduce their lending to Eurozone firms. Li, Li, Macchiavelli, and Zhou (2021) study the Covid crisis period, showing that MMFs with lower weekly liquid assets are more prone to preemptive investor runs. Our work takes a different perspective and investigates how MMFs adjust their portfolios in response to investor flows on a regular basis, using an extensive dataset over a 14-year period for both prime and government MMFs. Our approach underscores the importance of understanding intricate day-to-day portfolio management practices of MMFs in reaction to investor flows, a perspective hitherto unexplored in the MMF literature to the best of our knowledge.

Our paper also provides comprehensive insights on how open-end mutual fund adjust investment their strategies in reaction to investor flows. Jiang, Li, and Wang (2021) examine fund managers' liquidation strategies in response to investor flows in the context of corporate bond mutual funds. They show that amid redemptions, corporate bond mutual funds follow a "horizontal cut" liquidation strategy and tap into liquid asset holdings such as cash and government bonds, but switch to a "vertical cut" liquidation strategy and scale down their liquid and illiquid assets proportionally in times of stress. Our work expands the analysis to MMF universe, and carries out a thorough examination on three pivotal aspects of investment strategies including credit risk, interest rate exposures, and liquidity management.

Moreover, our paper enriches the understanding on how MMFs manage their portfolios in reaction to evolving macroeconomic and regulatory conditions. La Spada (2018) shows how MMFs' risk-taking behaviors are influenced by monetary policy rates, while Chodorow-Reich (2014) and Di Maggio and Kacperczyk (2017) analyze MMFs' adaptations to the zero lower bound

monetary policy. Furthermore, Li (2020) explores how MMFs adopt bundling portfolio strategies in reaction to conflicting liquidity regulations between MMFs and banks following the financial crisis. Sundaresan and Xiao (2018) and Gissler, Macchiavelli, and Narajabad (2023) shed light on how MMFs shift their portfolio composition following the 2016 SEC reforms on MMFs. In this strand of literature, a key contribution of our study is that we dive into a comprehensive examination on the multifaceted aspects of monetary policy rate impact on MMF investment decisions. We assess the impact from both current monetary policy rates, as indicated by the level of policy rates and the ultralow rate indicator, and the anticipation of future rate changes, in terms of both levels and volatility. Our findings illuminate the complex and dynamic decision-making process undertaken by MMFs regarding the risk profile, maturity structure, and liquidity positioning of their portfolios. MMFs do not merely respond to the prevailing monetary policy conditions but also adopt a forward-looking approach, to mitigate risks and to strike a delicate balance between generating yields and maintaining safety and liquidity in their portfolios.

3. Data and summary statistics

In this section, we provide an overview of our data sources and demonstrate how we construct our measures for the three dimensions of MMF portfolio management: credit risk, portfolio duration, and liquidity. Furthermore, we will present summary statistics of the key variables and discuss their pairwise correlations.

3.1 Data and measure construction

We study portfolio management of MMFs by using a sample spanning from January 2009 to February 2023. The primary data source for our analyses is iMoneyNet, which has long been accepted in the literature as a primary data source for MMFs due to its high-frequency observations and extensive coverage. It provides share class level information on a weekly basis. In accordance with prior literature, we aggregate the share class level data to the fund level. Our data includes basic fund characteristics such as assets under management (AUM), yields, fees, as well as liquidity measures such as the proportion of assets maturing within one week, and portfolio duration measures such as fund's weighted average maturity (WAM) and weighted average life (WAL). We also observe fund-level asset composition, as indicated by the portfolio allocations of

investments in various asset classes including repurchase agreements (repos), commercial paper, time deposits, other bank obligations which are mostly negotiable certificates of deposit (CDs), Treasuries, and government agency debts.

In this paper, we evaluate portfolio management of MMFs across three key dimensions: credit risk, portfolio duration, and liquidity. When analyzing MMFs' management of credit risk, our analysis is focused solely on prime MMFs since government MMFs, due to regulatory requirements, are limited to holding government securities and repos backed by government securities. As a result, government MMFs are commonly perceived as safe havens and not susceptible to credit risk. Drawing from previous research by Chodorow-Reich (2014) and Di Maggio and Kacperczyk (2017), we develop two intuitive measures to assess the credit risk management practices of prime MMFs: risky share (*Risky*) and concentration of risky holdings (*Concentration*). Risky share calculates the proportion of the fund's portfolio invested in commercial paper (both unsecured and asset-backed) and CDs. These types of assets carry the highest potential credit risks among MMF investments as they are issued by private firms and are not easily marketable in secondary markets. Therefore, prime MMFs may face difficulty in liquidating these investments if the creditworthiness of the issuer deteriorates. The concentration level of risky holdings is calculated as the sum of the squared portfolio shares in commercial paper and CDs, thereby forming a partial Herfindahl–Hirschman Index that captures the concentration of risky assets at the asset category level. A higher value of this measure indicates a greater concentration of risky positions held by a fund.

To proxy for MMFs' exposures to interest rate shocks, we utilize two duration indicators: WAM and WAL. WAM is a holding-weighted average of the effective maturities of all securities within an MMF's portfolio, with a maximum limit of 60 days under the SEC Rule 2a-7.[5] WAL, on the other hand, is a weighted average of the final maturities of all securities held by an MMF, with a maximum limit of 120 days under the SEC rule. The critical distinction between these measurements is that WAM considers interest rate resets associated with floating-rate securities while WAL does not. Given that MMFs, especially prime MMFs, generally hold their assets until maturity, their WAM and WAL are crucial factors in determining their susceptibility to interest rate fluctuations along the yield curve.

[5] SEC Rule 2a-7 is the principal rule regulating MMFs. See Security Exchange Commission (2014).

We also calculate two measures of MMF liquidity: the percentage of assets maturing within 7 days (*Mature7D*) and the percentage of assets that are relatively easy to adjust throughout the day (*Flexible*). *Mature7D* represents the portion of a MMF's assets that will naturally mature within a week. This measure is particularly relevant for prime funds, as for a notable fraction of assets held by these funds, there is little secondary market trading. Hence, *Mature7D* offers a helpful signal on the amount of cash available in the near future. *Flexible* indicates the proportion of MMF assets invested in repos, time deposits, and Treasury bills.[6] Among these assets, repos and time deposits usually have overnight maturity and can be accessed throughout the day.[7] Treasury bills, while having a longer maturity, can be traded easily in liquid secondary markets with same-day settlement until 3pm. Therefore, investments in these markets enable MMFs to easily handle unexpected redemption requests and sudden inflow surges. The higher the proportion of flexible assets in a MMF, the more flexibility it has in managing its daily liquidity.

3.2 Summary statistics

Table 1 provides a summary of fund-level characteristics for prime MMFs (Panel A) and government funds (Panel B) in our 14-year sample. Panel A shows that on average, prime MMFs have been in business for about 15 years and hold almost $9 billion in assets under management (AUMs), with near half of these assets coming from institutional investors. They charge fees to investors at a rate of 0.25% and provide excess yields of 20 basis points over monetary policy rate. On average, a typical prime MMF experiences a net weekly flow of about -0.14% of total assets. In terms of credit risk, prime MMFs, on average, invest about half of their assets in risky assets including commercial paper and CDs, and have a risky concentration measure of 0.22. The average portfolio duration for prime funds is 60 days for weighted average life (WAL) and 38 days for weighted average maturity (WAM). Lastly, the average proportion of assets maturing within a week is 41%, and 24% for flexible assets.

Panel B of Table 1 shows that, on average, government MMFs is 15 years old, and hold $12 billion in AUMs, with about 60% of these assets coming from institutional investors. They charge fees to investors at a rate of 0.21% and provide excess yields of 2 basis points over monetary policy rate. On average, a government fund experiences a net weekly flow of about 0.06% of total assets.

[6] Government MMFs are not allowed to invest in time deposits. Therefore, their *Flexible* measure is the total share of assets invested in repos and Treasury securities.
[7] For instance, the market for time deposits remains active until 6pm daily.

The average portfolio duration for government funds is 72 days for weighted average life (WAL) and 37 days for weighted average maturity (WAM). In comparison to prime funds, government funds hold more liquid portfolios, as 68% of their assets mature within one week and 70% are considered flexible.

We then proceed to examine pairwise correlations of fund-level characteristics, reported in Table 2. In particular, to capture the active portfolio management of fund managers, we use weekly changes (rather than levels) in credit risk, duration, and liquidity measures as our baseline dependent variables in regression tests. This approach allows us to not only capture "active" portfolio management, but also to partial out the effects of fund-specific factors on fund credit risk, duration, and liquidity. Panel A of Table 2 depicts the intuitive relationships among prime funds' credit risk, duration, and liquidity measures. It shows a positive correlation between the two credit risk measures (*Risky* and *Concentration*), as well as between the two duration measures (*WAL* and *WAM*), and the two liquidity measures (*Mature7D* and *Flexible*). Additionally, we observe a positive correlation between credit risk measures and duration measures, as well as a negative correlation of these two sets of measures with liquidity measures. Shifting our focus towards the correlations between portfolio measures and lagged fund flows, we observe that lagged fund flows are positively correlated with fund credit risk and duration, and negatively correlated with liquidity. Panel B of Table 2 displays consistent correlation patterns for government funds.

In the following sections, we will examine the impact of fund flows and monetary policy on MMF portfolio management through a multi-variate regression analysis. This method will enable us to control for the time-varying effects of other fund characteristics on portfolio management in different regulatory and economic circumstances.

4. How do investor flows drive MMFs' portfolio management?

MMF managers must decide how to adjust their portfolio allocations in response to investor flows. For example, in scenarios of inflows, fund managers might opt to proportionally distribute the new capital across various asset classes, preserving the existing balance in credit risk, duration, and liquidity. On the other hand, it is also possible that an influx of cash might prompt fund managers to invest more aggressively, allocating a larger portion of the portfolio to riskier assets, extending the duration of holdings, and reducing liquidity buffers. Similarly, in times of outflows, fund

managers might shift their portfolio towards safer assets with shorter durations to mitigate risk. In this section, we will examine how fund managers respond to investor flows using a panel regression model.

4.1 Baseline results

Using the sample spanning from January 2009 to February 2023, we conducted panel regressions at the fund-week level to estimate the relationship between weekly changes in fund portfolio measures and lagged investor flows for prime and government funds separately, as follows:

$$\Delta Portfolio\ Measure_{i,t} = \alpha + \beta\ Flow_{i,t\text{-}1} + \gamma\ X_{i,t\text{-}1} + \theta_t + \mu_i + \varepsilon_{i,t}, \quad (1)$$

where $\Delta Portfolio\ Measure_{i,t}$ encompasses the changes in six variables addressing three major dimensions of MMF portfolio management: credit risk (*Risky* and *Concentration*), portfolio duration (*WAL* and *WAM*), and liquidity levels (*Mature7D* and *Flexible*), and $Flow_{i,t-1}$ represents net investor flow over the previous week. To control for other lagged fund characteristics that may affect money fund investment decisions, we include logarithm of fund's assets under management (log(*AUM*)), expense ratio (*Expense*), fund gross yields (*Yield*), logarithm of fund age (log(*Age*)), and fraction of fund shares held by institutional investors (*Institutional Share*). We control for aggregate intertemporal variations in economic, regulatory, and monetary policy conditions by including a week-fixed effect (θ_t), which also effectively absorbs any industry-level shocks among MMFs. To partial out the influence of unobserved fund-specific factors on portfolio management, we also control for a fund-fixed effect (μ_i). Standard errors are clustered at the fund level.

Table 3 reports regression results for prime funds and government funds, respectively. Columns (1)-(2) display the impact of lagged flows on credit risk management for prime funds. The coefficients of lagged flows are positively and statistically significant at the 1% level, indicating that fund managers take on more credit risk when there are inflows from the previous week. Such effects are economically significant as well. Specifically, a one-standard-deviation rise in weekly net flow results in a 0.5-percentage-point increase in allocation to risky assets (equivalent to approximately 12% of the standard deviation), and a 0.4-percentage-point increase in risk concentration (around 11% of the standard deviation).

We proceed to investigate how investor flows affects MMFs' management of portfolio duration, using changes in WAL and WAM as dependent variables. Columns (3)-(4) present the

findings for prime funds, while Columns (7)-(8) summarize the results for government funds. Across these specifications, the coefficients for lagged flows are consistently positive and statistically significant at the 1% level. A one-standard-deviation increase in lagged flow corresponds to a 0.6-day increase in WAL (equivalent to 15 percent of its standard deviation) and a 0.5-day increase in WAM (equal to 14 percent of its standard deviation) for prime funds, and a 0.8-day increase in WAL (equivalent to 15 percent of its standard deviation) and a 0.5-day increase in WAM (equivalent to 13 percent of its standard deviation) for government funds. These findings provide strong evidence that inflows prompt MMFs to lengthen their portfolio durations.

We then examine how fund flows affects MMFs' liquidity management, using the change in shares of assets maturing within 7 days and the change in flexible shares as dependent variables. In Columns (5)-(6), we present the findings for prime funds, while Columns (9)-(10) summarize the results for government funds. Across all these specifications, the coefficients of lagged variables are consistently negative and statistically significant at the 1% level. A one-standard-deviation increase in lagged flow leads to a 0.6-percentage-point decrease in *Mature7D* (equivalent to 12 percent of its standard deviation) and a 0.6-percentage-point decrease in *Flexible* (equivalent to 15 percent of its standard deviation) for prime funds, and a 0.4-percentage-point decrease in *Mature7D* (equivalent to 6 percent of its standard deviation) and a 0.2-percentage-point decrease in *Flexible* (equivalent to 5 percent of its standard deviation) for government funds. These results suggest that MMFs typically reduce their liquid and flexible allocations in response to recent inflows and build up their liquidity reserves when faced with outflows.

Aside from responding to lagged investor inflows, fund managers also seem to consider several other fund characteristics when making investment decisions. Specifically, larger funds, presumably with more room to maneuver, tend to have longer portfolio durations and hold fewer liquid assets. Moreover, funds that charge higher management fees (i.e., higher expenses) typically exhibit longer portfolio durations and hold fewer liquid assets. This can be attributed to the fact that these funds are often viewed as more active in their portfolio management and may face greater pressure to generate higher yields, leading them to take on longer durations and hold fewer liquid assets. Additionally, funds that have achieved higher gross yields in the previous week seem to shift to a more conservative investment approach, reducing risk-taking and increasing their liquidity holdings.

In sum, our baseline results show that MMF managers tend to assume higher portfolio credit risk, increase portfolio duration, and reduce liquidity level when experiencing investor inflows over the past week.

4.2 The effects of inflows vs. outflows

While investor flows have been shown to impact MMFs' credit risk, portfolio duration, and liquidity, it is crucial to examine whether this impact is mainly driven by either inflows or outflows. This is particularly important from a financial stability perspective. If our findings primarily reflect a tendency for MMFs to increase risk and reduce liquidity reserves during inflows, it may raise concerns about financial instability. Alternatively, if our baseline results are primarily attributed to MMFs scaling back risk-taking and increasing liquidity reserves during outflows, it may alleviate instability concerns.

To investigate these questions, we establish two variables: $Inflow_{i,t}$ and $Outflow_{i,t}$. $Inflow_{i,t}$ ($Outflow_{i,t}$) equals the net flow for fund i during week t, if it is greater (less) than zero, and is set to zero otherwise. Next, we perform a panel regression with the week-fund sample from January 2009 to February 2023, while controlling for various fund characteristics, week- and fund-fixed effects and clustering standard errors at the fund level:

$$\Delta Portfolio\ Measure_{i,t} = \alpha + \beta_1\ Inflow_{i,t\text{-}1} + \beta_2\ Outflow_{i,t\text{-}1} + \gamma\ X_{i,t\text{-}1} + \theta_t + \mu_i + \varepsilon_{i,t}\,. \quad (2)$$

We report regression results in Table 4. As shown, coefficients on inflows and outflows exhibit a similar pattern as baseline results in all specifications for both prime and government funds. Thus, the breakdown of inflow and outflow analysis reveals that during periods of net redemptions (inflows), fund managers tend to decrease (increase) their credit risks, shorten (extend) the duration of their portfolio, and increase (decrease) their allocation to liquid assets. A comparison of the magnitude between β_1 and β_2 reveals that the effect of investor inflows on portfolio management is slightly more pronounced, suggesting that MMFs can be particularly active in their portfolio management when experiencing significant surges in inflows[8].

[8] We re-estimate Module (2) by first scaling the LHS and RHS variables with their corresponding standard deviations. Comparing the new estimates of β_1 and β_2, we continue to observe a slightly more pronounced effect from investor flows on portfolio management.

4.3 The effects of longer-term investor flows

Our baseline analyses suggest that managers of MMFs actively respond to the flows from the previous week and make appropriate adjustments to their credit risk, duration, and liquidity levels. However, one potential concern with this approach is that it only captures the immediate response of MMFs to short-term flows. It is uncertain whether this reflects a temporary adjustment in their portfolio or if it is indicative of the fund managers' overall investment strategy. Therefore, our next step is to examine whether fund managers also react to longer-term flows in a similar manner.

To achieve this, we substitute the previous-week investor flow in Equation (1) with the previous-month or previous-quarter investor flows. These are calculated as cumulative flows over the previous four or twelve-week window and labeled as *Long-Term Flow*$_{t\text{-}1}$. We then conduct the following panel regressions that control for week- and fund-fixed effects, and cluster standard errors at the fund level:

$$\Delta Portfolio\ Measure_{i,t} = \alpha + \beta\ Long\text{-}Term\ Flow_{i,t\text{-}1} + \gamma\ X_{i,t\text{-}1} + \theta_t + \mu_i + \varepsilon_{i,t}\,. \quad (3)$$

Table 5 reports regression results of Equation (3), with Panel A for prime funds and Panel B for government funds. The results show a significant impact of both lagged monthly and quarterly flows on MMFs' credit risk, portfolio duration, and liquidity. These effects of longer-term flows are consistent with weekly results and are statistically significant at the 1% level, although they show a smaller economic magnitude compared to the weekly results. Take Columns (1)-(2) in Panel A as an example. Section 1 indicates that for prime funds, a one-standard-deviation increase in the previous month's flow is associated with a 0.4-percentage-point rise in allocation to risky assets (equivalent to 9 percent of its standard deviation), and a 0.2-percentage-point increase in the risk concentration measure (about 7 percent of its standard deviation). Similarly, shown in Section 2 of Panel A, a one-standard-deviation increase in the previous quarter's flow results in a 0.2-percentage-point rise in allocation to risky assets (about 6 percent of its standard deviation), and a 0.1-percentage-point increase in the risk concentration measure (about 4 percent of its standard deviation).

Overall, our analyses on longer-term fund flows demonstrate the robustness of our findings on the impact of recent flows on MMFs' portfolio management. Furthermore, our findings also indicate that fund managers are expeditious in responding to investor flows and implementing proper adjustments.

4.4 Robustness

In this subsection, we further demonstrate the robustness of our findings with subsample analyses.

Subsamples by fund characteristics. As shown in summary statistics, MMFs exhibit considerable variations in their characteristics. This raises the question of whether our results are being driven by a small number of funds with particular features. To investigate this, we form subsamples of funds based on various fund traits and examine if the impact of investor flows on fund managers' portfolio decisions remains consistent for different types of funds. Taking fund size for an example, we sort funds into large and small subsamples based on whether the fund's AUMs are above or below the cross-section median. We then run the regression shown in Equation (1) for the two subsets of funds. Additionally, we carry out similar subsample analysis using the expense ratio, gross yield, fund age, and share of institutional investors as the cutoff criteria. Table 6 demonstrates that the tendency of MMFs to bolster portfolio credit risk and duration and to decrease liquidity after experiencing inflows is sustained regardless of their size, fee, performance, age, and institutional share.

Subsamples by regulatory environment. In October 2016, the Securities and Exchange Commission (SEC) implemented reforms on MMFs with the aim to enhance stability and minimize investor run risks. These reforms had a significant impact on prime funds, as the new rules required institutional prime funds to transition from a fixed $1 share price to a floating net asset value and offered all prime funds the option to impose liquidity fees and suspension gates on investors when their liquidity levels drop below certain threshold. Due to these regulatory changes, in the year leading to the reform implementation, total assets in prime MMFs decreased by around $1 trillion, with the majority of these funds being redirected to government MMFs.

Given that our sample covers the time before and after the 2016 SEC reforms MMFs, we need to consider whether our results are greatly influenced by the circumstances of that particular time period, especially the one year leading up to the implementation. We also need to explore if the reform has substantially changed how fund managers respond to investor inflows when making decisions about their portfolios.

First, we exclude the observations over the 12 months leading to the reform in October 2016 from our sample and re-estimate Equation (1) and present the results in Table 7. Results in Section 1 of Panel A show that the estimated coefficients on lagged investor flows across all specifications remain relatively unchanged as compared to baseline results, in terms of both economic magnitude

and statistical significance. This indicates that our results are not driven by the 2016 MMF reform era when prime funds saw considerable outflows and government funds experienced large inflows.

We then proceed to test whether the way of MMFs to manage their portfolios in reaction to investor flows persists both before and after the 2016 MMF Reform. We create two sub-period samples, the pre-reform (before October 2015) and the post-reform (after October 2016), and repeat panel regressions depicted in Equation (1) using the two subsamples. Section 2 summarize results for the pre-reform period, and Section 3 for the post-reform period, both of which exhibit similar patterns as in the whole sample baseline case.

We repeat these subperiod analyses for government funds and present the results in Panel B of Table 7. Coefficients on lagged investor flows exhibit similar patterns as those in the baseline analysis and are statistically significant across all specifications.

Overall, these results indicate that MMFs' active management of portfolio credit risk, duration, and liquidity levels in response to investor flows is prevalent both before and after the 2016 reform.

5. Impact of monetary policy on MMF portfolio management

In the previous section, we examine how investor flows, which determine the stability of MMFs' liabilities, influence MMF portfolio decisions. In this section, we will explore how monetary policy rates, the primary driver of MMFs' asset valuation, affect MMF portfolio management.

5.1 Why does monetary policy matter to MMFs?

Monetary policy rates have a significant impact on the valuation of assets and the overall performance of MMFs. Several factors contribute to this relationship.

Firstly, MMFs are mandated to invest in short-term securities with a maturity of fewer than 397 days. This makes MMFs differ notably from fixed-income mutual funds, which predominantly invest in long-term bonds. The performance of these long-term bonds is subject to a wide array of market and firm-specific factors, leading to significant fluctuations and unpredictability in returns. In contrast, MMF performance is primarily driven by policy rates, which account for approximately 90% of MMF yield movements. Furthermore, MMFs are efficient in passing on policy-driven yield changes to their investors, as illustrated in Figure 1. This efficiency stands in

stark contrast to bank deposit rates, which tend to respond more slowly to policy rate adjustments and demonstrate lower efficiency in transmitting monetary policy changes. These characteristics highlight the distinct role of MMFs in the financial market and the profound influence of monetary policy rates on fund's performance.

Moreover, as shown in Figure 1, there is a strong correlation between policy rate levels and the dispersion of fund performance. This means that in a high policy rate environment, there is a greater chance for investors to distinguish between MMFs with superior performance and those that fall behind. Taking all of this into consideration, it is reasonable to expect MMFs to closely monitor policy rate movements and adjust their portfolios accordingly.

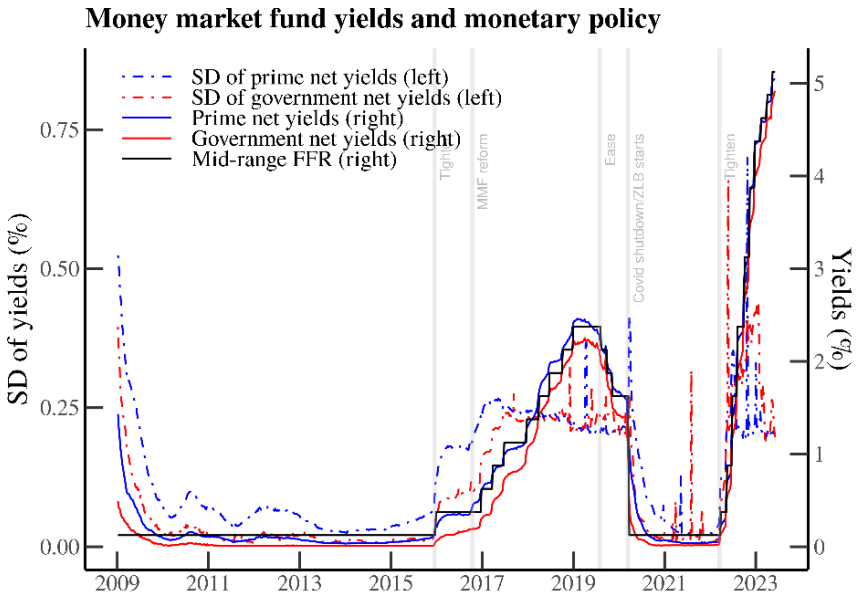

Figure 1. MMF yields and policy rate

This figure shows the time series of cross-sectional mean (right axis, in percent) and standard deviation (left panel, in percent) of prime and government MMF yields at weekly frequency, along with the time series of mid-range target federal fund rates (right axis, in percent).

In this section, we construct a range of factors related to monetary policy rates, including both past conditions and expected future movements. Specifically, we will be looking at the mid-range target federal funds rates as an indication of the level of monetary policy rates (referred to as the *Policy Rate*). To further examine this topic, we also create an indicator variable to identify whether we are in an ultralow interest rate regime (known as *Ultralow Rate*), with a value of one assigned if the *Policy Rate* falls below 0.25%, and zero otherwise. To gauge future changes in the monetary

policy rate, we utilize two forward-looking measures based on the pricing of interest rate derivatives. The first measure, expected policy rate change, is defined as the expected one-quarter ahead effective federal funds rate minus the current effective federal funds rate: ($\mathbb{E}_t$ [$EFFR_{t+qtr}$] − $EFFR_t$), where the one-quarter ahead federal funds rates are estimated by the cubic-spline model using data of overnight index swap (OIS) contracts.[9] The second measure, monetary policy uncertainty, is measured by the implied volatility of one-quarter ahead federal funds rates based on the pricing of at-the-money swaptions. The sample period for analyzing the impact of monetary policy is from October 2011 to February 2023, due to the availability of data on interest rate derivatives. Additionally, we exclude the one-year period preceding the implementation of the SEC reform in October 2016 in order to minimize the impact of the reform on our findings during the transition phase.

We report the summary statistics and pair-wise correlation among these monetary policy variables in Table 8. Panel A shows that over our sample period, the policy rate is 82 basis points on average, ranging from a minimum of 12 basis points to a maximum of 4.62 percent, and nearly 60% of our sample period falls into an ultralow interest rate regime. In terms of expectation for future policy rates, the expect rate change over the subsequent quarter is 12 basis points on average, and the maximum expected rate reduction (increase) is 0.98 (1.74) percent. Meanwhile, monetary policy uncertainty over the subsequent quarter is 43 basis points on average, ranging from 10 basis points to 1.8 percent in our sample. Panel B of Table 8 shows pair-wise correlation among these variables. Monetary policy uncertainty is positively correlated with policy rate and expected rate change, suggesting that market participants are more uncertain about future movements of monetary policy rates in a higher policy rate environment and when there is a higher chance of rate hikes within the following quarter. Consistently, we observe a negative correlation between policy uncertainty and ultralow rate indicator.

For the rest of this section, we examine how these monetary policy rate factors impact MMFs' portfolio decisions pertaining to credit risk, portfolio duration, and liquidity.

5.2 The impact of monetary policy: hypothesis development

In this subsection, we develop four testable hypotheses for the impact of monetary policy rate on MMFs' portfolio management.

[9] OIS contracts are liquid floating-fixed interest swaps with the floating leg tied to federal funds rates.

Intuitively, an environment with a higher monetary policy rate offers more opportunities for MMFs to make profits. In addition, as Figure 1 indicates, the dispersion of fund performance increases as policy rates rise, allowing MMFs to stand out from their peers. This may incentivize fund managers to take a more aggressive approach by taking on more risk and keeping lower liquidity buffers, leading to our first hypothesis:

Hypothesis 1*. MMFs tend to increase their credit risk, extend the duration of their portfolios, and reduce liquidity when facing higher policy rates.*

When the central bank adopts an unconventional monetary policy and sets the policy rate close to zero, both the profitability and variation in MMF performance are greatly diminished. This could lead to interesting changes in MMF investment behavior. Government funds, whose investments are limited to government securities and repos backed by government debt, face greater pressures to stay solvent as these assets offer minimal yields. Thus, they may opt to extend portfolio duration in order to provide investors with positive returns after fees in this ultralow rate environment. Prime funds, however, are faced with a different game in this ultralow rate environment. With the option to invest in securities issued by private firms, prime funds experience less pressure to survive compared to government funds; in addition, they have little incentives to try outperforming peers due to the inherent difficulty of distinguishing from each other in an ultralow rate environment. All these likely prompt prime funds to follow a more conservative investment strategy when policy rates are close to zero, holding secure and liquid positions and standing ready for withdrawals during this special economic episode. This forms our second conjecture:

Hypothesis 2*. In an ultralow rate regime, prime MMFs tend to invest more conservatively, reducing risk-taking behavior and holding more liquidity, whereas government MMFs tend to extend portfolio duration to stay afloat*.

In addition to current policy rate levels, MMF managers are likely to take into account their expectations of future policy rate movements when making portfolio decisions. Since expected rate change captures the difference between the projected one-quarter ahead policy rate and the current rate, this variable is highly likely to be influential in the decision-making process. Intuitively, fund managers that anticipate a rise in policy rates may tilt away from long-duration

assets and increase liquidity. By doing so, their relatively liquid and flexible portfolios will allow them to take advantage of higher yields following the expected rate hike. Conversely, if they anticipate a decrease in policy rates, they may tilt their portfolios towards longer-term assets to capitalize on current high interest rates. This leads us to our third conjecture:

Hypothesis 3. *When expecting a rise in policy rates, MMFs tend to reduce portfolio durations and increase liquidity*. *When expecting a decrease in policy rates, MMFs tend to extend portfolio durations and reduce liquidity*.

Finally, we consider how monetary policy uncertainty affects the investment decisions of MMFs. At times of high risk, prime funds are particularly susceptible to investor runs, whereas government funds are typically viewed as safe havens. As policy uncertainty represents a source of risk, to assess its impact on portfolio decisions, it is critical to differentiate between prime and government funds. When monetary policy uncertainty is high, prime funds may reduce their exposure to credit risk, shorten portfolio duration, and increase their liquidity position. Conversely, government funds, perceived as relatively safe amid rising monetary policy uncertainty, may have the incentive to take advantage of term premiums and invest in longer-term government and agency debt. This leads us to our fourth conjecture:

Hypothesis 4. *When anticipating higher levels of uncertainty regarding monetary policy rate, prime MMFs tend to decrease their risk exposure and stockpile liquidity, whereas government MMFs move their investments to longer-term securities.*

5.3 The impact of monetary policy: baseline results

To test the hypotheses in Section 5.2, we employ the following panel regression model using the week-fund sample spanning from October 2011 to February 2023:

$$\Delta Portfolio\ Measure_{i,t} = \alpha + \beta_1\, Policy\ Rate_{t\text{-}1} + \beta_2\, Ultralow\ Rate_{t\text{-}1} + \beta_3\, Expected\ Change_{t\text{-}1} + \beta_4\, Policy\ Uncertainty_{t\text{-}1} + \theta\, Market_{t\text{-}1} + \rho\, Flow_{i,t\text{-}1} + \gamma\, X_{i,t\text{-}1} + \mu_i + \varepsilon_{i,t}\,, \quad (4)$$

where $\Delta Portfolio\ Measure_{i,t}$ is the same six portfolio measures covering credit risk, duration, and liquidity of fund *i* over week *t*. The four policy rate variables, *Policy Rate*, *Ultralow Rate*, *Expected Change*, and *Policy Uncertainty*, are all calculated as of week *t*-1, with the last two forward-

looking variables estimated based on derivative prices one quarter ahead. To disentangle the effects of other market-wide factors on MMF portfolios from those of monetary policy rate variables, we control for a few market-level variables (denominated as $Market_{t\text{-}1}$). In particular, we include the difference between the yield of 1-month Treasury bill and policy rate, *Slope*, which captures term premium that is most relevant for MMFs given that the average duration (measured in WAM) for prime and government funds being a little over 30 days. Moreover, we include the *VIX* to account for sentiment in the broader financial markets. Finally, we control for lagged fund flows ($Flow_{i,t\text{-}1}$) and other lagged fund characteristics ($X_{i,t\text{-}1}$) as used in Table 3, as well as fund-fixed effect (μ_i). The standard errors are clustered at the fund level.

Impact of monetary policy rates. We present the regression results of Equation (4) in Table 9. First, we focus on the effect of monetary policy rate levels on MMFs' portfolio management over the subsequent week. Panel A shows that, for prime funds, the coefficients on *Policy Rate* are positive in the regressions for credit risk and duration, and negative in the regressions for liquidity, statistically significant at the 1% levels in five out of six specifications. These results are economically significant. Specifically, a one-percentage-point increase in *Policy Rate* over the preceding week is associated with 0.9-percentage-point rise in the allocation to risky assets, and 0.6-percentage-point increase in risk concentration measure. Moreover, one-percentage-point increase in *Policy Rate* is associated with a 1.5-day and 0.3-day increase in WAL and WAM, respectively. Additionally, when it comes to liquidity management, one-percentage-point increases in *Policy Rate* reduce the share of assets maturing within 7 days and the share of flexible assets by 1 and 0.8 percentage points, respectively. Panel B provides consistent evidence for government funds, although with lower statistical significance.

Overall, the regression results indicate that MMFs are more likely to boost credit risk and portfolio duration while reducing their liquidity buffers when interest rates are higher. These findings are consistent with Hypothesis 1 and may be driven by MMFs' incentives to take advantage of higher interest rates, which offer greater room for profitability and make it easier for MMFs with aggressive strategies to differentiate themselves from their competitors.

Impact of ultralow interest rates. Next, we investigate the impact of an ultralow interest rate regime on the portfolio management of MMFs. Panel A of Table 9 show that in this environment, prime funds reduce credit risk, shorten portfolio duration, and increase liquidity, after controlling for the policy rate level. Specifically, switching to ultralow rate regime is associated with 0.5-

percentage-point decrease in allocation to risky assets, 0.3-percentage-point decrease in risk concentration measure, 1.1 (0.2) day decrease in WAL (WAM), and 0.8 (0.6)-percentage-point increase in the share of assets maturing within 7 days (share of flexible assets). These effects are all statistically significant at the 1% level. During periods of ultralow rates, a prime fund's incentives to outperform other prime funds are low due to the challenge of distinguishing between slight performance differences. Thus, the top priority for prime funds is to remain secure and liquid, in order to cope with withdrawal requests in this particular economic period. Hence prime funds are likely to adopt a more conservative investment strategy when policy rates are close to zero.

These findings are related to those of Di Maggio and Kacperczyk (2017), which conducts an event study to examine the responses of MMFs to five FOMC announcements indicating a prolonged period of close-to-zero policy rates. Their results show that prime funds tend to take on riskier positions but reduce duration three to six months after the announcements. While our finding of prime funds reducing duration under an ultralow rate regime is consistent to theirs, our results of prime funds reducing credit risk seem to differ. However, an important difference between our methodology and theirs is that they study how an outlook for prolonged ultralow rate environment affects prime MMFs' investment decisions using a sample from 2009 to 2013 that covers only the ultralow rate period, whereas our 2011-2023 sample includes both ultralow rate and normal policy periods, and our goal is to assess the impact of ***switching to*** an ultralow rate environment on MMFs' investment.

Next, we analyze the impact of ultralow rate on government funds' portfolio management. Panel B shows that government funds employ a distinct strategy from prime funds and extend their WAL (WAM) by an average of 0.2 (0.1) days when they are operating in an ultralow rate environment. Government funds are under great pressure to generate positive net yields when policy rates are close to zero. Constrained by regulation, their investments are limited to government and agency debt and repos backed by those debt. Thus, in order to attain slightly higher yields, the only option available to government funds is to increase the duration of their assets. To balance out this extended portfolio duration, government funds hold more flexible assets in their portfolios, also shown in Panel B.

To sum, our findings on the impact of ultralow rate support Hypothesis 2, which conjectures that in an ultralow rate environment, prime MMFs would invest more conservatively, while government MMFs would extend portfolio duration in order to stay afloat.

Impact of expected rate change. We then examine the effects of expected rate changes on the portfolio management of MMFs. Table 9 (Panel A and Panel B) shows consistent results for prime and government funds: when MMFs anticipate a rate increase, they reduce their portfolio duration and increase their liquidity; conversely, when MMFs expect a rate decrease, they take the opposite actions. Specifically, for prime funds, one-percentage-point increase in expected rate change is associated with 0.5 (0.4)-day decrease in WAL (WAM) and 0.3-percentage-point increase in allocation to both maturing-in-7-day assets and flexible assets. For government funds, one-percentage-point increase in expected rate change is associated with 0.7-day decrease in both WAL and WAM, and 0.1-percentage-point increase in allocation to assets maturing in 7 days.

These findings lend strong support to the conjectures put forward in Hypothesis 3. It appears that fund managers are seeking to maximize their profits by exploiting their estimation of future changes in interest rates. When they perceive an impending increase in policy rates, they reduce their allocation of long-term assets and increase liquidity, which allows them to limit potential losses in the value of existing assets and to maximize their capacity to invest in higher-yield assets following the rate hike. Conversely, if MMFs anticipate a decrease in policy rates, they are likely to tilt their portfolios towards longer-term assets to capitalize on current high interest rates.

Impact of monetary policy uncertainty. Finally, we investigate the impact of monetary policy uncertainty on MMF portfolio management. Our measure of monetary policy uncertainty is based on the pricing of interest rate derivatives and captures the degree of disagreement in the market around the one-quarter ahead policy rates. According to Panel A of Table 9, prime MMFs respond to heightened policy uncertainty by decreasing their credit risk, shortening their portfolio duration, and increasing their liquidity levels. Specifically, a one-percentage-point rise in policy uncertainty is associated with a 0.5-percentage-point reduction in the share of risky assets, a 0.3-percentage-point reduction in the risk concentration measure, a 0.3-day decrease in WAL, and a 0.3-percentage-point rise in the allocation to flexible assets. These findings indicate that prime fund managers, and possibly their investors, are well-attuned to the risks presented by monetary policy uncertainty. If future policy rate movements are perceived to be more unpredictable, prime funds are likely to adopt a more conservative portfolio management approach.

Monetary policy uncertainty represents a significant source of risk for prime funds and their investors, as these funds are particularly susceptible to runs in times of turbulence. Government funds, however, are generally seen as providing safety due to the types of investments they make. Thus, we anticipate that government MMFs may exhibit distinct responses to perceived policy uncertainty. Indeed, Panel B shows that for government MMFs, a one-percentage-point increase in policy uncertainty is associated with a 0.3-day increase in both WAL and WAM and a decrease in liquid asset holdings by 0.1 to 0.2 percentage points; all these effects were statistically significant at the 1% levels.

Several reasons may explain our findings regarding government funds. With little fear of investor runs, government funds may capitalize on term premiums by investing in longer-term government and agency debt, in times of high policy uncertainty. They also have convenient access to investments of floating-rate agency debt, allowing them to effectively protect against unwanted interest rate movements. Additionally, they may even opt to hold government securities with maturities beyond the anticipated period of interest rate turbulence.

Overall, we find that prime MMFs tend to adopt more conservative investments and government MMFs more aggressive in times of heightened monetary policy uncertainty. These findings lend strong support to Hypothesis 4. As a summary of all our baseline results in Table 9, we find that both prime and government MMFs are highly attentive to past conditions and future expectations of monetary policy, and actively manage their portfolios in response. Additionally, Table 9 shows that the impact of recent flows on MMF portfolio decision, documented in Section 4, sustains in the presence of monetary policy influence.

5.4 The longer-term impact of monetary policy

The baseline analyses demonstrate that monetary policy rate has a substantial influence on MMFs' portfolio management over the subsequent week. However, there is a concern that these effects merely reflect temporary portfolio adjustments, not lasting strategic changes in response to monetary policy. To tackle this issue, this subsection investigates whether the effect of monetary policy carries on and even strengthens over a more extended period.

To this end, we replace portfolio changes over the following week with those over the following month (i.e., four weeks) and carry out a panel regression as shown in Equation (4) using

a month-fund sample. All control variables and fixed effects remain unchanged from the baseline analysis, and standard errors are clustered at the fund level.

Panel A of Table 10 presents the regression results for prime funds. Section 1 report the month-fund regression results of portfolio changes over the following month. Compared with the baseline results, coefficients of the four monetary policy variables generally remain consistent in terms of sign and statistical significance across all specifications, suggesting a robustness of our findings on the effect of monetary policy over a longer period. Taking the impact of policy rate on prime MMFs' portfolios as an example, a one-percentage-point rise in 1-month lagged policy rate is associated with a two-percentage-point rise in the allocation of risky assets, and a 1.3-percentage-point increase in risk concentration measure over the following month. Moreover, a one-percentage-point increase in lagged policy rate reduces the share of assets maturing within 7 days and the portion of flexible assets by three percentage points.

We then replace dependent variables with portfolio changes over the following quarter (i.e., a period of 12 weeks) and carry out a panel regression as illustrated in Equation (4) that uses data from a quarter-fund sample. Section 2 presents the regression results of this new set of tests, which are consistent with those obtained using weekly and monthly observations.

We repeat the above monthly and quarterly analyses for government funds and report the results in Section 1 and Section 2 of Panel B, respectively. The overall patterns are similar to what we observe in the prime fund sample.

Im sum, our findings suggest that the impact of monetary policy on MMF portfolio decisions is not short-lived; rather, it persists over the coming weeks/months.

6. Conclusion

In this paper, we explore portfolio management of MMFs, focusing on their responses to investor flows and monetary policy changes. MMFs, managing a substantial $6 trillion in assets, play a vital role in short-term funding and in the transmission of monetary policy. Our study delves deep into the complexities of MMF portfolio decisions, considering crucial aspects such as credit risk, portfolio duration, and liquidity management.

Our findings reveal that investor flows significantly influence MMF portfolio strategies. Increased inflows generally prompt MMFs to increase allocations to riskier assets and risk

concentration measures, extend portfolio durations, and reduce liquidity reserves. These trends hold true across various fund types and under different regulatory environments, demonstrating a robust approach by MMFs to managing risk and liquidity in response to investor flows. This tendency is not just a transient reaction to short-term investor flows, as it holds true for longer-term flows, hence likely reflecting strategic management by MMFs.

Our study also provide evidence that monetary policy rates, a critical determinant of MMFs' asset valuations, exert a profound influence on MMF portfolio management decisions. Our study illustrates that higher policy rates prompt MMFs to increase their credit risk and extend portfolio durations, as such environment offers greater potential for increased profits and more room for MMFs to stand out from their peers. Conversely, in ultralow rate regimes, prime MMFs tend to adopt more conservative strategies, reducing credit risk, shortening duration, and increasing liquidity, while government MMFs extend portfolio durations to stay afloat amidst minimal yields.

Moreover, we show that anticipations and associated uncertainties of policy rate changes further shape MMF strategies. Expecting rate hikes, MMFs shorten portfolio durations and boost liquidity to better position themselves for future high yields. In contrast, anticipating rate cuts, they shift towards longer-term assets to leverage on current high interest rates. This forward-looking approach enables MMFs to align their portfolios with projected market trends effectively. Additionally, our study show that, in responding to monetary policy uncertainty, prime funds, more vulnerable to investor runs, adopt a risk-averse stance, reducing risk exposure and stockpiling liquidity; on the other hand, government funds, facing minimum run risks, pivot towards longer-term securities, aiming to benefit from term premiums in high uncertainty environments.

Finally, by analyzing the effects of the four monetary policy factors on MMFs' longer-term portfolio changes, we show that the impact of monetary policy on MMF portfolio management is not transient but rather persists over time.

In conclusion, our research offers rich insights on how MMFs manage their portfolios in response to investor flows and monetary policy changes. This study highlights the complex and dynamic nature of MMF investment strategies and underscores the importance for MMFs to strike a delicate balance between risk-taking and liquidity management in an ever-evolving financial landscape. These insights are crucial for regulators and market participants to understand and navigate through the complex world of MMFs.

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Table 1. Summary Statistics of MMF Variables

Table 1 provides summary statistics for the MMF variables used in our sample of January 2009 to February 2023. Variables definitions are provided in Appendix. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

		Avg	SD	P25	P50	P75	N
Levels	**Risky (%)**	52.94	20.07	43	55	66	92,536
	Concentration	21.74	15.87	11.3	18.5	28.45	92,536
	WAL (days)	60.27	22.69	46	61	77	68,267
	WAM (days)	37.87	13.54	29	39	48	92,458
	Mature7D (%)	41.44	16.67	32	40	49	91,619
	Flexible (%)	23.83	17.37	11	22.22	33	92,536
Weekly Change	**Change in Risky (%)**	-0.09	3.95	-2	0	2	92,536
	Change in Concentration	-0.05	3.15	-1.21	0	1.15	92,536
	Change in WAL (days)	-0.08	4.23	-2	0	2	67,986
	Change in WAM (days)	-0.06	3.34	-2	0	2	92,414
	Change in Mature7D (%)	0.11	5.37	-2	0	3	91,378
	Change in Flexible (%)	0.09	4.17	-1	0	2	92,536
Fund Characteristics	**Flow (%)**	-0.14	3.78	-1.19	-0.17	0.94	92,536
	Age (year)	14.82	6.68	10.34	15.84	19.29	92,536
	AUM (billions)	8.55	18.76	0.45	1.67	7.62	92,536
	Expense (%)	0.25	0.15	0.16	0.21	0.3	92,460
	Institutional Share (%)	46.74	47.47	0	22.66	100	92,536
	Yield - Policy Rate (%)	0.2	0.23	0.08	0.15	0.24	92,460

Panel B. Government MMFs

		Avg	SD	P25	P50	P75	N
Levels	**WAL (days)**	71.9	28.35	50	77	96	92,720
	WAM (days)	36.99	14.15	28	39	48	111,769
	Mature7D (%)	67.94	27.33	51	69	98	109,909
	Flexible (%)	70	30.46	45	75	100	111,869
Weekly Change	**Change in WAL (days)**	-0.04	5.51	-3	-1	2	92,499
	Change in WAM (days)	-0.06	3.88	-2	0	2	111,738
	Change in Mature7D (%)	0.08	5.53	-1	0	1	109,607
	Change in Flexible (%)	0.05	3.53	0	0	0	111,866
Fund Characteristics	**Flow (%)**	0.06	4.64	-1.52	-0.09	1.48	111,869
	Age (year)	14.7	8.04	6.69	16.11	20.94	111,869
	AUM (billions)	12.33	27.97	0.5	2.11	12.25	111,869
	Expense (%)	0.21	0.26	0.09	0.17	0.26	111,695
	Institutional Share (%)	59.25	45.99	0	91.04	100	111,869
	Yield - Policy Rate (%)	0.02	0.22	-0.05	0	0.07	111,695

Table 2. Pairwise Correlation of Key MMF Variables

Table 2 provides pairwise correlation of changes on key variables capturing MMF portfolio decisions, including *Risky, Concentration, WAL, WAM, Mature7D,* and *Flexible. Flow* is lagged by one week. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

	Risky	Concen.	WAL	WAM	Mature7D	Flexible
Change in Concentration	0.88					
Change in WAL (days)	0.2	0.15				
Change in WAM (days)	0.22	0.18	0.76			
Change in Mature7D (%)	-0.24	-0.2	-0.41	-0.43		
Change in Flexible (%)	-0.81	-0.7	-0.3	-0.26	0.28	
Flow (%)	0.14	0.12	0.14	0.13	-0.13	-0.15

Panel B. Government MMFs

	WAL	WAM	Mature7D	Flexible
Change in WAM (days)	0.73			
Change in Mature7D (%)	-0.26	-0.26		
Change in Flexible (%)	-0.21	-0.15	0.18	
Flow (%)	0.15	0.13	-0.06	-0.05

Table 3. Impact of Investor Flows on MMF Portfolio Management

This table reports weekly panel regression results of Model (1) over the sample period of January 2009 to February 2023. The dependent variables are changes in six variables addressing three major dimensions of MMF portfolio management: credit risk (*Risky* and *Concentration*), portfolio duration (*WAL* and *WAM*), and liquidity (*Mature7D* and *Flexible*). Independent variables include $Flow_{i,t-1}$, which is net investor flow over the previous week, logarithm of fund's assets under management (log(*AUM*)), expense ratio (*Expense*), fund gross yields (*Yield*), logarithm of fund age (log(*Age*)), and fraction of fund shares held by institutional investors (*Institutional Share*), lagged by one week. Fund- and week-fixed effects are controlled for. Standard errors are clustered at the fund level, with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

	Credit Risk		Portfolio Duration		Liquidity	
Independent Variable	**(1) Risky**	**(2) Concen.**	**(3) WAL**	**(4) WAM**	**(5) Mature7D**	**(6) Flexible**
Flow	0.134 ***	0.094 ***	0.167 ***	0.121 ***	-0.168 ***	-0.165 ***
	(0.009)	(0.008)	(0.01)	(0.007)	(0.01)	(0.01)
log(AUM)	0.022	0.004	0.09 ***	0.039 **	-0.083 ***	-0.04
	(0.02)	(0.017)	(0.033)	(0.016)	(0.025)	(0.027)
Expense	0.197 *	0.066	0.454 ***	0.153 *	-0.476 ***	-0.546 ***
	(0.104)	(0.083)	(0.146)	(0.086)	(0.105)	(0.092)
Yield	-0.478 ***	-0.495 ***	-2.916 ***	-0.552 ***	1.019 ***	0.645 ***
	(0.142)	(0.101)	(0.567)	(0.121)	(0.16)	(0.147)
log(Age)	-0.085	0.03	-0.024	0.03	0.081	0.033
	(0.068)	(0.049)	(0.094)	(0.045)	(0.063)	(0.074)
Institutional Share	0	0	0.001	0.001	0	0.001
	(0.001)	(0)	(0.001)	(0.001)	(0.001)	(0.001)
Adj. R-sq	0.037	0.028	0.058	0.065	0.053	0.04
N	92188	92188	67946	92077	91051	92188
Fund FEs	Y	Y	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y	Y	Y

Panel B. Government MMFs

	Portfolio Duration		Liquidity	
Independent Variable	**(7) WAL**	**(8) WAM**	**(9) Mature7D**	**(10) Flexible**
Flow	0.179 ***	0.109 ***	-0.078 ***	-0.039 ***
	(0.011)	(0.005)	(0.007)	(0.008)
log(AUM)	0.272 ***	0.087 ***	-0.082 ***	-0.066 ***
	(0.048)	(0.018)	(0.018)	(0.013)
Expense	0.47 *	0.242 **	-0.219 **	-0.095
	(0.257)	(0.11)	(0.085)	(0.071)
Yield	-0.696 *	-0.337 **	0.35 ***	0.222 **
	(0.376)	(0.153)	(0.117)	(0.096)
log(Age)	-0.072	-0.033	0.127 ***	0.051
	(0.064)	(0.03)	(0.037)	(0.032)
Institutional Share	0	0	-0.001	0
	(0.001)	(0)	(0.001)	(0)
Adj. R-sq	0.042	0.037	0.018	0.009
N	92363	111339	109221	111433
Fund FEs	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y

Table 4. Impact of Inflows vs. Outflows on MMF Portfolio Management

This table reports weekly panel regression results of Model (2) over the sample period of January 2009 to February 2023. The dependent variables are changes in six variables addressing three major dimensions of MMF portfolio management: credit risk, portfolio duration, and liquidity. New independent variables include $Inflow_{i,t-1}$ ($Outflow_{i,t-1}$), which are set to the net flow for fund *i* during week *t-1* if greater (less) than zero, and are set to zero otherwise. Other fund characteristics in Table 3 are also controlled for and lagged by one week. Fund- and week-fixed effects are controlled for. Standard errors are clustered at the fund level, with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

	Credit Risk		Portfolio Duration		Liquidity	
Independent Variable	**(1) Risky**	**(2) Concen.**	**(3) WAL**	**(4) WAM**	**(5) Mature7D**	**(6) Flexible**
Inflow	0.151 ***	0.105 ***	0.203 ***	0.141 ***	-0.21 ***	-0.193 ***
	(0.012)	(0.01)	(0.015)	(0.01)	(0.014)	(0.014)
Outflow	0.117 ***	0.083 ***	0.13 ***	0.101 ***	-0.126 ***	-0.137 ***
	(0.011)	(0.009)	(0.012)	(0.008)	(0.012)	(0.013)
Adj. R-sq	0.037	0.028	0.058	0.065	0.053	0.04
N	92188	92188	67946	92077	91051	92188
Fund Controls	Y	Y	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y	Y	Y

Panel B. Government MMFs

	Portfolio Duration		Liquidity	
Independent Variable	**(7) WAL**	**(8) WAM**	**(9) Mature7D**	**(10) Flexible**
Inflow	0.207 ***	0.118 ***	-0.085 ***	-0.042 ***
	(0.018)	(0.007)	(0.01)	(0.011)
Outflow	0.144 ***	0.098 ***	-0.069 ***	-0.035 ***
	(0.014)	(0.007)	(0.009)	(0.008)
Adj. R-sq	0.042	0.037	0.018	0.009
N	92363	111339	109221	111433
Fund Controls	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y

Table 5. Impact of Longer-Term Flows on MMF Portfolio Management

This table reports weekly panel regression results of Model (3) over the sample period of January 2009 to February 2023. The dependent variables are changes in six variables addressing three major dimensions of MMF portfolio management: credit risk, portfolio duration, and liquidity. New independent variable includes *Longer-Term Flow*$_{i,t-1}$ measured by the cumulative net investor flows over the previous month (quarter) in Section 1 (2). Other fund characteristics in Table 3 are also controlled for and lagged by one week. Fund- and week-fixed effects are controlled for. Standard errors are clustered at the fund level, with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

	Credit Risk		Portfolio Duration		Liquidity	
Independent Variable	**(1) Risky**	**(2) Concen.**	**(3) WAL**	**(4) WAM**	**(5) Mature7D**	**(6) Flexible**
Section 1. Month						
Longer-Term	0.047 ***	0.03 ***	0.068 ***	0.043 ***	-0.067 ***	-0.06 ***
Flow	(0.005)	(0.003)	(0.005)	(0.003)	(0.005)	(0.005)
Adj. R-sq	0.029	0.02	0.05	0.057	0.048	0.029
N	91363	91363	67887	91255	90248	91363
Section 2. Quarter						
Longer-Term	0.015 ***	0.009 ***	0.024 ***	0.012 ***	-0.023 ***	-0.022 ***
Flow	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Adj. R-sq	0.024	0.017	0.042	0.05	0.045	0.023
N	89165	89165	67688	89058	88089	89165
Fund Controls	Y	Y	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y	Y	Y

Panel B. Government MMFs

	Portfolio Duration		Liquidity	
Independent Variable	**(7) WAL**	**(8) WAM**	**(9) Mature7D**	**(10) Flexible**
Section 1. Month				
Longer-Term	0.084 ***	0.045 ***	-0.034 ***	-0.019 ***
Flow	(0.007)	(0.003)	(0.003)	(0.003)
Adj. R-sq	0.038	0.031	0.017	0.009
N	92136	110525	108432	110615
Section 2. Quarter				
Longer-Term	0.035 ***	0.016 ***	-0.013 ***	-0.008 ***
Flow	(0.004)	(0.002)	(0.002)	(0.001)
Adj. R-sq	0.031	0.026	0.015	0.007
N	91527	108396	106339	108486
Fund Controls	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y

Table 6. Robustness of Flow Impact on Portfolio Management: by Fund Characteristics

This table reports weekly panel regression results of Model (1) over the sample period of January 2009 to February 2023 for subsamples of MMFs. Different sets of subsamples are formed based on whether the fund's characteristics are above or below the cross-section median of fund AUM, expense ratio, gross yield, and fund age, respectively. We also form subsamples of funds based on whether its institutional share is above 50% or not. The dependent variables are changes in six variables addressing three major dimensions of MMF portfolio management: credit risk, portfolio duration, and liquidity. Key independent variable is $Flow_{i,t-1}$, which is net investor flow over the previous week. Other fund characteristics in Table 3 are also controlled for and lagged by one week. Fund- and week-fixed effects are controlled for. Standard errors are clustered at the fund level, with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. We skip reporting adjusted R-square and sample size for brevity. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

	Credit Risk		Portfolio Duration		Liquidity	
	(1) Risky	(2) Concen.	(3) WAL	(4) WAM	(5) Mature7D	(6) Flexible
Subsample 1. by Size						
Large	0.158 ***	0.105 ***	0.181 ***	0.129 ***	-0.184 ***	-0.186 ***
	(0.01)	(0.008)	(0.011)	(0.008)	(0.01)	(0.012)
Small	0.113 ***	0.084 ***	0.152 ***	0.115 ***	-0.154 ***	-0.145 ***
	(0.015)	(0.013)	(0.015)	(0.01)	(0.015)	(0.015)
Subsample 2. by Expense						
High	0.137 ***	0.093 ***	0.183 ***	0.134 ***	-0.176 ***	-0.166 ***
	(0.015)	(0.011)	(0.014)	(0.011)	(0.015)	(0.016)
Low	0.133 ***	0.094 ***	0.161 ***	0.116 ***	-0.166 ***	-0.166 ***
	(0.01)	(0.009)	(0.011)	(0.008)	(0.011)	(0.011)
Subsample 3. by Yield						
High	0.139 ***	0.096 ***	0.195 ***	0.131 ***	-0.181 ***	-0.171 ***
	(0.013)	(0.01)	(0.012)	(0.009)	(0.014)	(0.014)
Low	0.132 ***	0.094 ***	0.144 ***	0.114 ***	-0.157 ***	-0.162 ***
	(0.013)	(0.011)	(0.014)	(0.009)	(0.012)	(0.012)
Subsample 4. by Age						
Old	0.144 ***	0.1 ***	0.172 ***	0.129 ***	-0.17 ***	-0.17 ***
	(0.013)	(0.012)	(0.018)	(0.011)	(0.016)	(0.017)
Young	0.128 ***	0.091 ***	0.165 ***	0.116 ***	-0.168 ***	-0.162 ***
	(0.013)	(0.011)	(0.012)	(0.008)	(0.013)	(0.013)
Subsample 5. by Institutional Share						
High	0.151 ***	0.105 ***	0.178 ***	0.13 ***	-0.184 ***	-0.186 ***
	(0.011)	(0.01)	(0.011)	(0.008)	(0.011)	(0.012)
Low	0.085 ***	0.06 ***	0.138 ***	0.099 ***	-0.125 ***	-0.104 ***
	(0.015)	(0.012)	(0.025)	(0.011)	(0.02)	(0.017)
Fund Controls	Y	Y	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y	Y	Y

Panel B. Government MMFs

	Portfolio Duration		Liquidity	
	(7) WAL	(8) WAM	(9) Mature7D	(10) Flexible
Subsample 1. by Size				
Large	0.192 ***	0.114 ***	-0.077 ***	-0.041 ***
	(0.01)	(0.006)	(0.009)	(0.008)
Small	0.171 ***	0.106 ***	-0.079 ***	-0.039 ***
	(0.016)	(0.008)	(0.01)	(0.011)
Subsample 2. by Expense				
High	0.177 ***	0.119 ***	-0.084 ***	-0.065 ***
	(0.016)	(0.007)	(0.009)	(0.011)
Low	0.18 ***	0.101 ***	-0.073 ***	-0.021 ***
	(0.012)	(0.006)	(0.008)	(0.006)
Subsample 3. by Yield				
High	0.21 ***	0.123 ***	-0.086 ***	-0.056 ***
	(0.012)	(0.006)	(0.008)	(0.009)
Low	0.149 ***	0.094 ***	-0.07 ***	-0.023 ***
	(0.013)	(0.007)	(0.009)	(0.007)
Subsample 4. by Age				
Old	0.193 ***	0.114 ***	-0.077 ***	-0.026 ***
	(0.017)	(0.005)	(0.009)	(0.009)
Young	0.165 ***	0.104 ***	-0.077 ***	-0.05 ***
	(0.015)	(0.009)	(0.009)	(0.011)
Subsample 5. by Institutional Share				
High	0.193 ***	0.115 ***	-0.078 ***	-0.035 ***
	(0.012)	(0.006)	(0.007)	(0.008)
Low	0.132 ***	0.093 ***	-0.078 ***	-0.054 ***
	(0.028)	(0.012)	(0.013)	(0.017)
Fund Controls	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y

Table 7. Robustness of Flow Impact on Portfolio Management: by Regulatory Environments

This table reports weekly panel regression results of Model (1) over the subperiods defined based on regulatory environments. Section 1 reports the results when we exclude the observations over the 12 months leading to the reform in October 2016 from our sample. Sections 2 and 3 report results over the pre-form (prior to October 2015), and post-reform (after October 2016) subperiods. The dependent variables are changes in six variables addressing three major dimensions of MMF portfolio management: credit risk, portfolio duration, and liquidity. Key independent variable is $Flow_{i,t-1}$, which is net investor flow over the previous week. Other fund characteristics in Table 3 are also controlled for and lagged by one week. Fund- and week-fixed effects are controlled for. Standard errors are clustered at the fund level, with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

	Credit Risk		**Portfolio Duration**		**Liquidity**	
	(1) Risky	**(2) Concen.**	**(3) WAL**	**(4) WAM**	**(5) Mature7D**	**(6) Flexible**
Section 1. Exclude reform year						
Flow	0.129 ***	0.093 ***	0.17 ***	0.123 ***	-0.168 ***	-0.161 ***
	(0.009)	(0.009)	(0.011)	(0.007)	(0.01)	(0.01)
Adj. R-sq	0.033	0.026	0.057	0.065	0.05	0.038
N	86138	86138	61954	86033	85123	86138
Section 2. Pre-reform						
Flow	0.125 ***	0.09 ***	0.168 ***	0.133 ***	-0.182 ***	-0.164 ***
	(0.012)	(0.011)	(0.015)	(0.009)	(0.013)	(0.012)
Adj. R-sq	0.027	0.02	0.051	0.061	0.049	0.035
N	66868	66868	42946	66788	66151	66868
Section 3. Post-reform						
Flow	0.142 ***	0.102 ***	0.169 ***	0.093 ***	-0.125 ***	-0.151 ***
	(0.013)	(0.011)	(0.011)	(0.008)	(0.013)	(0.014)
Adj. R-sq	0.048	0.04	0.07	0.086	0.066	0.047
N	19270	19270	19008	19245	18972	19270
Fund Controls	Y	Y	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y	Y	Y

Panel B. Government MMFs

	Portfolio Duration		Liquidity	
	(7) WAL	(8) WAM	(9) Mature7D	(10) Flexible
Section 1. Exclude reform year				
Flow	0.175 ***	0.109 ***	-0.081 ***	-0.036 ***
	(0.012)	(0.005)	(0.007)	(0.007)
Adj. R-sq	0.041	0.037	0.019	0.008
N	84727	103590	101762	103680
Section 2. Pre-reform				
Flow	0.138 ***	0.113 ***	-0.102 ***	-0.038 ***
	(0.012)	(0.008)	(0.011)	(0.009)
Adj. R-sq	0.035	0.034	0.021	0.009
N	33042	51062	50364	51094
Section 3. Post-reform				
Flow	0.203 ***	0.102 ***	-0.052 ***	-0.033 ***
	(0.019)	(0.005)	(0.007)	(0.011)
Adj. R-sq	0.045	0.038	0.009	0.006
N	51685	52528	51398	52586
Fund Controls	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y
Week FEs	Y	Y	Y	Y

Table 8. Summary Statistics on Macro Economic Variables

Panel A of this table provides summary statistics for a range of factors related to monetary policy, including *Policy Rate*, *Ultralow Rate*, *Expected Change*, and *Policy Uncertainty*, over the sample of October 2011 to February 2023 while excluding the observations over the 12 months leading to the October 2016 MMF Reform. We also report summary statistics on market-level variables including *Slope,* measured by the difference between the yield of 1-month Treasury bill and policy rate, and *VIX.* Panel B reports pairwise correlation of these variables. Variable definitions are provided in Appendix.

Panel A. Summary statistics

	Avg	SD	Min	P25	P50	P75	Max	N
Policy Rate	0.82	1.03	0.12	0.12	0.12	1.62	4.62	544
Ultralow Rate	0.58	0.49	0	0	1	1	1	544
Expected Change	0.12	0.34	-0.98	-0.01	0.02	0.14	1.74	544
Policy Uncertainty	0.43	0.33	0.1	0.23	0.33	0.46	1.8	544
Slope	-0.06	0.11	-0.56	-0.1	-0.07	-0.02	0.59	544
VIX	14.97	13.77	4.47	8.54	10.92	16.25	125.36	544

Panel B. Pairwise correlation

	Policy Rate	Ultralow Rate	Expected Change	Policy Uncertainty	Slope
Ultralow Rate	-0.79				
Expected Change	0.33	-0.34			
Policy Uncertainty	0.54	-0.44	0.74		
Slope	0.24	-0.17	0.29	0.02	
VIX	0.18	0.04	0.24	0.36	0.12

Table 9. Impact of Monetary Policy on MMF Portfolio Management

This table reports weekly panel regression results of Model (4) over the sample period of October 2011 to February 2023, excluding 12 months leading to the October 2016 MMF Reform. The dependent variables are changes in six variables addressing three major dimensions of MMF portfolio management: credit risk, portfolio duration, and liquidity levels. Independent variables include four policy rate variables, *Policy Rate*, *Ultralow Rate*, *Expected Change*, and *Policy Uncertainty*, are all calculated as of week *t*-1, with the last two forward-looking variables estimated based on derivative prices one quarter ahead. We also control for *Slope,* measured by the difference between the yield of 1-month Treasury bill and policy rate, and *VIX.* Finally, we control for lagged fund flows ($Flow_{i,t-1}$) and other lagged fund characteristics reported in Table 3. Fund-fixed effects are controlled for. Standard errors are clustered at the fund level, with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

	Credit Risk		**Portfolio Duration**		**Liquidity**	
Independent Variable	**(1) Risky**	**(2) Concen.**	**(3) WAL**	**(4) WAM**	**(5) Mature7D**	**(6) Flexible**
Policy Rate	0.886 ***	0.642 ***	1.533 ***	0.256 *	-1.029 ***	-0.863 ***
	(0.153)	(0.103)	(0.234)	(0.149)	(0.146)	(0.17)
Ultralow Rate	-0.49 ***	-0.277 ***	-1.107 ***	-0.154 **	0.833 ***	0.616 ***
	(0.095)	(0.058)	(0.133)	(0.073)	(0.092)	(0.09)
Expected Change	-0.136 *	-0.074	-0.537 ***	-0.38 ***	0.334 ***	0.257 ***
	(0.076)	(0.057)	(0.101)	(0.063)	(0.071)	(0.067)
Policy Uncertainty	-0.457 ***	-0.28 ***	-0.276 **	-0.092	0.038	0.273 ***
	(0.081)	(0.059)	(0.112)	(0.08)	(0.094)	(0.077)
Slope	-0.352	-0.103	1.944 ***	0.768 ***	-0.847 ***	0.247
	(0.237)	(0.175)	(0.285)	(0.196)	(0.232)	(0.2)
VIX	0.006 ***	0.004 **	0.01 ***	0.004 ***	-0.004 *	-0.007 ***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Flow	0.133 ***	0.095 ***	0.16 ***	0.11 ***	-0.162 ***	-0.156 ***
	(0.01)	(0.009)	(0.01)	(0.007)	(0.011)	(0.011)
Adj. R-sq	0.017	0.012	0.023	0.017	0.015	0.022
N	56003	56003	55056	55925	55300	56003
Fund Controls	Y	Y	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y	Y	Y

Panel B. Government MMFs

	Portfolio Duration		Liquidity	
Independent Variable	**(7) WAL**	**(8) WAM**	**(9) Mature7D**	**(10) Flexible**
Policy Rate	0.878 ***	0.197	-0.185	0.126
	(0.3)	(0.14)	(0.113)	(0.102)
Ultralow Rate	0.193 ***	0.056 *	0.033	0.074 ***
	(0.063)	(0.033)	(0.035)	(0.027)
Expected Change	-0.724 ***	-0.657 ***	0.128 **	-0.007
	(0.089)	(0.056)	(0.05)	(0.049)
Policy Uncertainty	0.318 ***	0.329 ***	-0.173 ***	-0.141 ***
	(0.085)	(0.064)	(0.064)	(0.053)
Slope	1.206 ***	0.978 ***	-0.719 ***	0.082
	(0.295)	(0.175)	(0.216)	(0.125)
VIX	-0.003 *	0	0.001	0.003 ***
	(0.002)	(0.001)	(0.001)	(0.001)
Flow	0.177 ***	0.104 ***	-0.072 ***	-0.038 ***
	(0.012)	(0.005)	(0.007)	(0.008)
Adj. R-sq	0.021	0.016	0.003	0.001
N	80268	81664	80024	81736
Fund Controls	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y

Table 10. Impact of Monetary Policy on Longer-Term MMF Portfolio Management

This table reports panel regression results of Model (4) over the sample period of October 2011 to February 2023, excluding 12 months leading to the October 2016 MMF Reform. In Section 1 (Section 2), the dependent variables are monthly (quarterly) changes in six variables capturing three dimensions of portfolio management including credit risk, portfolio duration, and liquidity over the subsequent month (quarter), and regressions are estimated based on a fund-month (fund-quarter) sample. Independent variables include four policy rate variables, *Policy Rate*, *Ultralow Rate*, *Expected Change*, and *Policy Uncertainty*, are all calculated as of week *t*-1, with the last two forward-looking variables estimated based on derivative prices one quarter ahead. Lagged market-level variables including *Slope* and *VIX,* and lagged fund flows ($Flow_{i,t-1}$) are also included but omitted from the table for brevity. Other lagged fund characteristics reported in Table 3 are also controlled for. Fund-fixed effects are controlled for. Standard errors are clustered at the fund level, with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Panel A presents results for prime funds, while Panel B for government MMFs.

Panel A. Prime MMFs

	Credit Risk		Portfolio Duration		Liquidity	
Independent Variable	**(1) Risky**	**(2) Concen.**	**(3) WAL**	**(4) WAM**	**(5) Mature7D**	**(6) Flexible**
Section 1. Monthly panel						
Policy Rate	2.027 ***	1.25 ***	6.005 ***	-0.174	-2.591 ***	-3.257 ***
	(0.583)	(0.361)	(1.013)	(0.644)	(0.674)	(0.655)
Ultralow Rate	-1.328 ***	-0.566 ***	-3.715 ***	-0.475 *	3.016 ***	2.159 ***
	(0.365)	(0.207)	(0.497)	(0.266)	(0.323)	(0.308)
Expected Change	-0.531 *	-0.122	-1.542 ***	-0.741 **	0.905 ***	1.313 ***
	(0.297)	(0.239)	(0.393)	(0.296)	(0.272)	(0.244)
Policy Uncertainty	-1.288 ***	-0.758 ***	-1.766 ***	-0.89 ***	0.271	0.527 **
	(0.263)	(0.196)	(0.419)	(0.33)	(0.302)	(0.253)
Adj. R-sq	0.005	-0.003	0.009	0.001	0.007	0.02
N	13790	13790	13563	13773	13627	13790
Section 2. Quarterly panel						
Policy Rate	9.12 ***	5.175 ***	13.808 ***	7.128 ***	-6.534 ***	-9.162 ***
	(1.42)	(1.003)	(2.813)	(1.942)	(1.318)	(1.513)
Ultralow Rate	-2.489 ***	-1.966 ***	-10.073 ***	-4.681 ***	5.778 ***	5.949 ***
	(0.903)	(0.601)	(1.34)	(0.826)	(0.82)	(0.999)
Expected Change	-2.366 ***	-0.974	-1.93 *	-0.075	0.638	2.808 ***
	(0.844)	(0.623)	(1.16)	(0.793)	(0.73)	(0.669)
Policy Uncertainty	-4.026 ***	-2.396 ***	-6.291 ***	-11.023 ***	0.415	0.981
	(1.204)	(0.906)	(1.637)	(1.375)	(0.883)	(0.885)
Adj. R-sq	0.016	-0.001	0.011	0.029	0.031	0.04
N	4520	4520	4444	4517	4457	4520
Fund Controls	Y	Y	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y	Y	Y

Panel B. Government MMFs

Independent Variable	Portfolio Duration		Liquidity	
	(7) WAL	(8) WAM	(9) Mature7D	(10) Flexible
Section 1. Monthly panel				
Policy Rate	2.119 ***	0.539	-1.599 ***	-0.11
	(0.628)	(0.443)	(0.471)	(0.367)
Ultralow Rate	0.426 **	0.095	-0.006	0.254 ***
	(0.199)	(0.127)	(0.106)	(0.096)
Expected Change	-2.631 ***	-2.596 ***	0.769 ***	0.196
	(0.315)	(0.195)	(0.207)	(0.18)
Policy Uncertainty	1.041 ***	1.385 ***	-0.661 ***	-0.739 ***
	(0.303)	(0.209)	(0.215)	(0.214)
Adj. R-sq	-0.002	0	0.001	-0.002
N	19854	20220	19816	20244
Section 2. Quarterly panel				
Policy Rate	1.444 **	0.001	-1.987 *	-1.783 **
	(0.642)	(0.51)	(1.09)	(0.777)
Ultralow Rate	0.85 *	-0.394	-0.162	-0.364
	(0.488)	(0.298)	(0.273)	(0.267)
Expected Change	-3.33 ***	-4.17 ***	0.851 *	0.473
	(0.797)	(0.494)	(0.512)	(0.533)
Policy Uncertainty	0.052	-0.161	-2.369 ***	-2.931 ***
	(1.051)	(0.641)	(0.59)	(0.598)
Adj. R-sq	-0.009	-0.003	-0.011	-0.004
N	6576	6696	6575	6705
Fund Controls	Y	Y	Y	Y
Fund FEs	Y	Y	Y	Y

Appendix. Variable Definitions

Variables	Definition
Key MMF portfolio variables	
Risky (%)	Share of portfolio in CPs and CDs.
Concentration	Sum of squared shares of portfolio in CPs and CDs.
WAL (days)	Weighted-average life is assets-weighted days to final maturity.
WAM (days)	Weighted-average maturity is assets-weighted days final maturity or days to interest rate reset dates, whichever is earlier.
Mature7D (%)	Share of portfolio that will mature within 7 days.
Flexible (%)	Share of portfolio in repurchase agreements, time deposits and Treasuries. Government MMFs do not hold time deposits.
Flow (%)	Percentage net growth rate of AUM defined as (weekly change of assets under management (AUM) divided by AUM of last week)-1 times hundred.
Other MMF characteristics	
Age (year)	Calculated as number of calendar days since the first appearance in the iMoneyNet data divided by 365.
AUM (billions)	Assets under management.
Expense (%)	Calculated as 7-day gross yield minus 7-day net yield in annual rate.
Institutional Share (%)	Calculated as sum of AUMs of institutional share classes divided by AUMs of all share classes within a fund.
Yield - Policy Rate (%)	Calculated as 7-day gross yield minus policy rate calculated as average of lower and upper targets of the federal funds rate.
Monetary policy variables	
Policy Rate	Calculated as average of lower and upper targets of the federal funds rate.
Ultralow Rate	Calculated as a dummy variable equal to 1 whenever policy rate is below 25 basis points, and 0 otherwise.
Expected Change	Calculated as the expected one-quarter ahead effective federal funds rate minus the current effective federal funds rate.
Policy Uncertainty	Calculated as implied volatilities of the 3-month ahead policy rate computed from the interest swaptions.
Other macroeconomic variables	
Slope	Calculated as constant maturity 1-month Treasury yield minus policy rates.
VIX	Chicago Board Options Exchange's CBOE Volatility Index