

## **Finance and Economics Discussion Series**

Federal Reserve Board, Washington, D.C.

ISSN 1936-2854 (Print)

ISSN 2767-3898 (Online)

# **Bank Deposit Flows to Money Market Funds and ON RRP Usage during Monetary Policy Tightening**

**Luke Morgan, Anthony Sarver, Manjola Tase, and Andrei Zlate**

**2022-060**

Please cite this paper as:

Luke Morgan, Anthony Sarver, Manjola Tase, and Andrei Zlate (2022). “Bank Deposit Flows to Money Market Funds and ON RRP Usage during Monetary Policy Tightening,” Finance and Economics Discussion Series 2022-060. Washington: Board of Governors of the Federal Reserve System, <https://doi.org/10.17016/FEDS.2022.060>.

NOTE: Staff working papers in the Finance and Economics Discussion Series (FEDS) are preliminary materials circulated to stimulate discussion and critical comment. The analysis and conclusions set forth are those of the authors and do not indicate concurrence by other members of the research staff or the Board of Governors. References in publications to the Finance and Economics Discussion Series (other than acknowledgement) should be cleared with the author(s) to protect the tentative character of these papers.

# Bank Deposit Flows to Money Market Funds and ON RRP Usage during Monetary Policy Tightening<sup>1</sup>

Luke Morgan, Anthony Sarver, Manjola Tase, Andrei Zlate<sup>2</sup>

Federal Reserve Board

July 2022

## Abstract

Using the historical experience from past monetary tightening cycles and the market-expected path of the federal funds rate for the current tightening cycle, we project that the flows from bank deposits to money market funds (MMFs) would be relatively small, at about \$600 billion through the end of 2024, or about 3 percent of current bank deposits. Of these potential inflows to MMFs, about \$100 billion are projected to flow into the overnight reverse repo (ON RRP) facility, or about 7 percent of MMFs' recent take-up. Other factors such as the private demand for repo funding and the net supply of Treasury bills are expected to have more substantial effects on MMFs' take-up at the ON RRP facility than the inflows from bank deposits.

*JEL Classification:* E43, E52, E58.

*Keywords:* Monetary policy tightening, bank deposits, money market funds, overnight reverse repo facility, private repo funding, Treasury bills.

---

<sup>1</sup> We thank Alyssa Anderson, David Bowman, Jim Clouse, Rochelle Edge, Heather Ford, Chris Gust, Patrick McCabe, Zeynep Senyuz, Mary-Frances Styczynski, Annette Vissing-Jorgensen, Min Wei, and Rebecca Zarutskie for helpful comments and suggestions, as well as Paul Cochran, Hampton Dennis, John Kadlick, and Andrew Wei for excellent research assistance. The views expressed in this study are those of the authors and do not necessarily reflect the views of the Federal Reserve Board or the Federal Reserve System.

<sup>2</sup> Corresponding authors: Tase ([manjola.tase@frb.gov](mailto:manjola.tase@frb.gov)), Zlate ([andrei.zlate@frb.gov](mailto:andrei.zlate@frb.gov)).

## 1. Introduction

With take-up at the Federal Reserve's overnight reverse repurchase agreement (ON RRP) facility reaching above \$2.0 trillion in May 2022, some market participants expected facility usage to grow further, given expected flows from bank deposits to money market funds (MMFs) as the federal funds rate (FFR) increases. This development would have implications for the Federal Reserve's current balance sheet runoff cycle and the relative pace of decline of reserves and ON RRP.

To address these concerns, we summarize the historical experience during past episodes of monetary policy tightening, and address two key questions relating to the current tightening cycle. First, what is the likely magnitude of flows from bank deposits into MMFs? Second, how will these flows and other factors affect take-up at the ON RRP facility over the period 2022-24?

To answer these questions, we examine the historical experience during past tightening cycles in 2004-06 and 2015-18, when FFR increases coincided with a widening spread between MMF yields and bank deposit rates. In turn, the widening spread prompted flows from bank deposits to MMFs. Furthermore, to assess the implications for ON RRP take-up, we observe the experience during the most recent previous tightening episode, when MMFs' take-up at the ON RRP as a share of their AUM was largely shaped by the availability of substitute investment opportunities, such as private repo and Treasury bills. The magnitude of these historical relationships guide our projections of flows from bank deposits to MMFs and the latter's ON RRP take-up during the current tightening cycle.

Our main findings are as follows. First, based on the historical experience and using the future path of the FFR from the June 2022 Desk Survey, we project that the flows from bank deposits to MMFs would be relatively small, at about \$600 billion through the end of 2024, or equivalent to about 3 percent of current bank deposits. This estimate is similar to the percentage estimated for the 2004-06 and 2015-18 tightening episodes.

Second, of these potential inflows to MMFs, about \$100 billion are projected to flow into the ON RRP facility through the end of 2024, which represents only about 7 percent of the May 2022 take-up by MMFs.<sup>3</sup>

Third, other factors such as the private demand for repo funding and the net supply of Treasury bills are expected to have more substantial effects on ON RRP take-up. These factors are projected to cause MMFs' portfolio allocation to the ON RRP facility to initially increase in

---

<sup>3</sup> See <https://www.newyorkfed.org/markets/desk-operations/reverse-repo> for details on ON RRP operations results. Data detailing propositions accepted by counterparty type are added to the summary of [results](#) each month, with the data lagged by one month. The information is made available within the first five business days of each month.

2022:Q2 and to remain relatively elevated throughout 2022. Afterwards, ON RRP take-up is projected to decline in 2023 amid policy tightening and an increase in net Treasury bill issuance.

Fourth, under alternative scenarios, bank deposit flows could be larger, or MMFs' portfolio allocation at the ON RRP facility could be higher than our baseline projections. We find that the later scenarios—in which MMFs' take-up would be higher due to lower-than-projected rates for private repo funding or a lower-than-projected net Treasury bill issuance—would have a more substantial effect on ON RRP take-up than the inflows from bank deposits.

Finally, the pace of decline in ON RRP take-up depends on a number of factors, and there is considerable uncertainty around our projections, which has implications for the pace of decline in reserves as the Fed's balance sheet runs off.

Our analysis is related to the deposit channel of monetary policy transmission, whereby increases in the FFR coincide with a rising opportunity cost of holding bank deposits, which in turn prompts outflows from bank deposits especially in more concentrated deposit markets (Drechsler, Savov, and Schnabl, 2017). However, we focus on the widening spread between MMF net yields and bank deposit rates and the resulting flows from bank deposits specifically to MMFs. Furthermore, we study the effect of deposit flows on MMFs' take-up at the ON RRP rather than on bank lending. Our analysis is also related to the literature documenting the asymmetric response of bank deposit rates to increases vs. decreases in market rates, which varies with the deposit type, bank size, and market concentration (Neumark, Sharpe, 1992; Driscoll and Judson, 2013).

Our analysis also contributes to the expanding literature on the ON RRP facility and its implications. Most closely related to our paper is Anderson and Huther (2016), which derives projections for ON RRP take-up at the participant level for a very short horizon (1-5 days) and no changes in the stance of monetary policy. In contrast, our analysis derives quarterly projections over a three-year horizon and starts at a time of switching from monetary policy easing to monetary policy tightening.

## **2. Developments at the ON RRP facility during the period 2021:Q1-2022:Q1**

The Federal Reserve uses the ON RRP facility as a supplementary policy tool to help control the FFR and keep it in the target range set by the FOMC.<sup>4</sup> A wide range of counterparties—primary dealers, banks, MMFs, and government sponsored enterprises—are eligible to participate in the ON RRP. Thus, the ON RRP offers an alternative risk-free investment option subject to a

---

<sup>4</sup> This tool is in addition to Fed's primary tool, the IORB rate for managing overnight interest rates. The IORB rate is the rate paid to depository institutions on balances maintained at Federal Reserve Banks.

counterparty limit to a broad range of financial institutions that are ineligible to earn interest on reserve balances (IORB).<sup>5</sup>

MMFs account for the majority of take-up at the ON RRP facility. Among investment alternatives for MMFs, the ON RRP is the closest substitute to private repo and Treasury bills. During periods of low interest rates and high liquidity in the system, private repo trades close to the ON RRP offering rate, making the ON RRP facility an attractive investment for eligible MMFs. However, during periods of quantitative tightening, when liquidity in the system declines, dealers' demand for repo financing and the spread between private repo and the ON RRP offering rate tend to increase. As a result, private repo becomes relatively more attractive and usage at the ON RRP facility declines. In addition, the availability of alternative investment opportunities for MMFs such as the supply of Treasury bills affects usage of the facility.

Take-up at the ON RRP facility began to increase in mid-2021 and reached \$2.0 trillion in mid-May 2022, with MMFs—primarily government MMFs—accounting for \$1.7 trillion in take-up.

We distinguish three main drivers behind the elevated take-up at the ON RRP facility. First, government MMFs' assets under management (AUM) continued to remain at high levels (around \$4 trillion) following substantial growth since the start of the pandemic. Second, a decline in Treasury bill supply limited investment options for MMFs. As shown in Figure 1, the large increase in ON RRP take-up during the second half of 2021 started around the same time as a large decrease in net Treasury bill supply. Third, amid the contracting supply of alternative investments, the spreads on these investments declined, making these alternative investments less attractive than investing at the ON RRP facility. As shown in Figure 2, since the second half of 2021, SOFR traded at (and at times just under) the ON RRP offering rate, and Treasury bill yields were lower relative to the expected path of the ON RRP rate.<sup>6</sup>

During the 2022 tightening episode, some market participants expect MMFs to receive large inflows, in part from flows from bank deposits. ON RRP take-up could be pushed to even higher levels in the near-term and stay elevated as a result of such inflows. However, ON RRP take-up would also be affected by the supply of alternative investments available to MMFs and the rates that these offer relative to the ON RRP.

---

<sup>5</sup> The list of ON RRP counterparties is available [here](#). More information on the ON RRP facility can be found [here](#).

<sup>6</sup> Figure 2 shows an indirect measure of the Treasury bill spread to the expected path of the ON RRP rate with the 1-month Treasury bill – OIS spread.

Figure 1

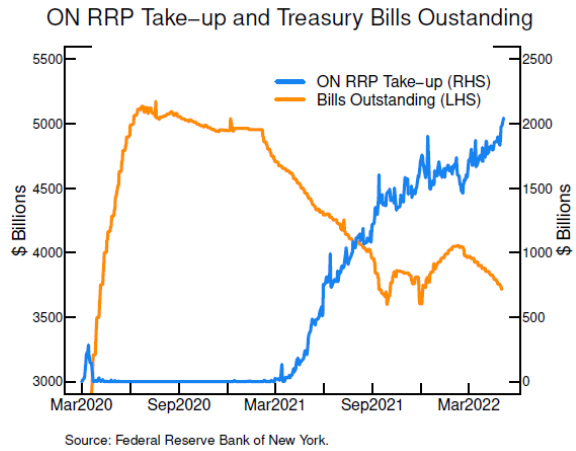
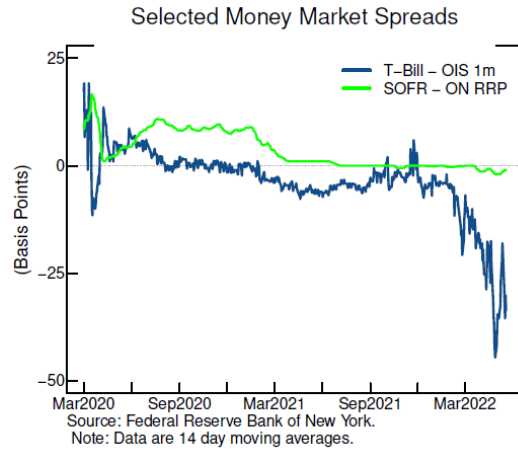


Figure 2



### 3. Historical experience

We discuss key factors affecting flows from bank deposits to MMFs and MMFs’ take-up at the ON RRP facility during previous episodes of monetary policy tightening.

#### 3.1. Historical experience with bank deposit flows to MMFs

One key driver of flows from bank deposits to MMFs has been the spread between MMF yields net of fees and bank deposit rates. This spread, shown in red in Figure 3, widened during past episodes of FFR increases, highlighted in grey.<sup>7</sup> During both episodes, the spread rose in the same proportion with the FFR, by about 60 bps for every 100 bps of FFR increase.<sup>8</sup> MMF yields are typically more responsive than bank deposit rates to FFR increases, because the yields that MMFs offer to investors are more closely connected to the returns on their underlying assets, given differences in their business models, exposures to risk, and market competition (Neumark, Sharpe, 1992; Driscoll and Judson, 2013; Drechsler, Savov, and Schnabl, 2017).

As a result of the widening spreads, some investors shifted from bank deposits toward MMFs during periods of policy tightening, as shown by the bars in Figure 4. These bars represent the ratios of MMF shares to bank deposit amounts held by three different counterparties—non-bank financial institutions, non-financial corporates, and households—constructed from the Financial

<sup>7</sup> During the first episode, the FFR target was raised by 425 bps from 1 percent before the June 2004 FOMC meeting to 5¼ percent at the June 2006 FOMC meeting. During the second episode, the FFR target range was raised by 225 bps from 0 to ¼ percent before the December 2015 FOMC meeting to 2¼ to 2½ percent at the December 2018 FOMC meeting.

<sup>8</sup> We compute the average MMF net yield from iMoneyNet, Inc. data as the weighted average of yields net of fees for taxable funds, and the average deposit rate from Call Report data as the interest expense on all interest-bearing deposits divided by the quarterly average of such deposits. On average, the MMF net yields rose by about 90 bps and the bank deposit rates rose by 30 bps for every 100 bps increase in the FFR.

Accounts of the U.S. data, the Z.1 statistical release.<sup>9</sup> For each counterparty, the average ratios generally observed around the start and the end of the two episodes of FFR increases are shown in blue and orange, respectively. To allow for lagged effects of FFR increases on deposit flows, the end-date ratios reflect the levels reached two quarters after the last FFR increase in each episode.<sup>10</sup>

Figure 3

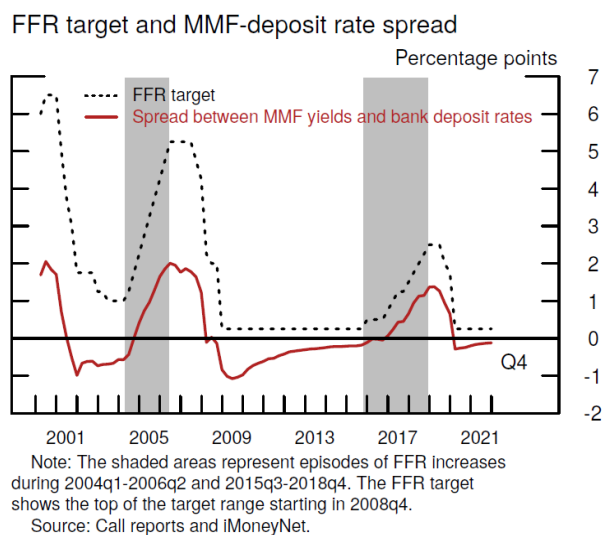
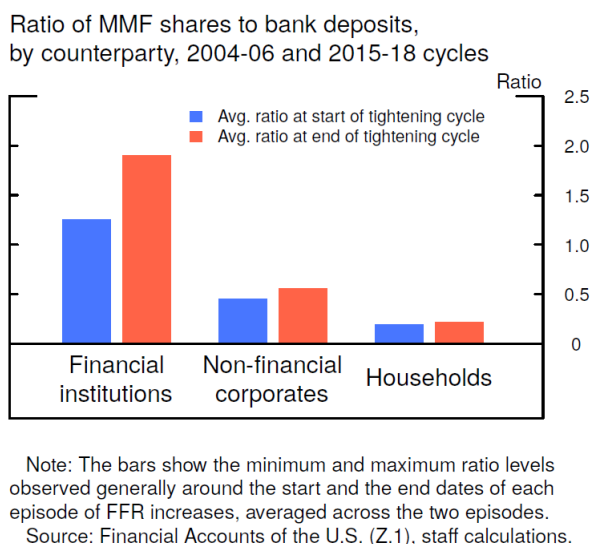


Figure 4



As can be seen in Figure 4, these ratios increased when the FFR increased—and the spread between MMF yields and bank deposit rates widened—reflecting shifts from bank deposits to MMFs. Moreover, the ratio responses varied across the three counterparties. The taller bars and larger increases for financial institutions show that these counterparties have held larger amounts of MMF shares relative to their bank deposits, and have been more responsive to widening spreads. In contrast, non-financial corporations and households have been relatively less sensitive to widening spreads. Nevertheless, flows from non-financial corporations and households still

<sup>9</sup> We select the holdings of non-supervised non-bank financial institutions from the Z.1. data. We exclude bank holding companies, broker-dealers, GSEs, mutual funds, and ETFs, because such financial institutions may have had regulatory incentives to hold bank deposits and thus be less interest rate-sensitive on their liquid assets. Specifically, for checking deposits, we include property and life insurers, private pension funds, state and local government pension funds, finance companies, and REITs. For savings and time deposits, we include private pension funds, state and local government pension funds, and finance companies. For MMF shares, we include property and life insurers, private pension funds, state and local government pension funds, and other financial businesses.

<sup>10</sup> Specifically, the start-date ratios are those observed in 2004:Q1 and 2015:Q3, and the end-date ratios refer the levels from 2006:Q4 and 2019:Q2, respectively, thus allowing for a two-quarter lag after the last FFR increase. In cases when the ratios declined for part of the time during FFR increases, we use the minimum and maximum ratios observed in each episode, instead of the start and end-date ratios. In these cases, the ratios were already declining before the tightening episode, and the decline was temporarily reversed during tightening. By this criterion, 2005:Q3 and 2017:Q2 are the start dates for households across the two episodes; 2016:Q4 and 2017:Q4 are the start and end dates for non-financial corporates, while 2018:Q4 is the end date for financials in the most recent episode.

played an important role, because the vast majority of bank deposits in our sample are held by these counterparties.

### 3.2. Experience with MMF inflows and ON RRP usage during the prior tightening episode

The most recent episode of monetary policy tightening may be most instructive for the current episode given the experience with the balance sheet reduction.

MMFs, the primary users of the ON RRP, received large inflows in the prior tightening episode from both banks and non-banks (Figure 5). These flows were driven in part by MMF yields rising relative to the rates offered on bank deposits or longer-dated fixed income investments. Cumulative net MMF inflows over the episode mostly occurred in 2018 and 2019, amid the latter stages of increases in the FFR and balance sheet runoff, when longer-term market rates declined and even fell below MMF yields following a flattening of the Treasury yield curve. These large inflows continued to occur in the months after monetary tightening ended.

Figure 5

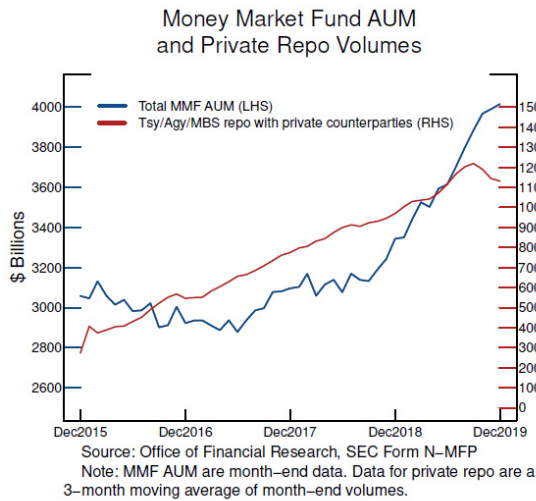
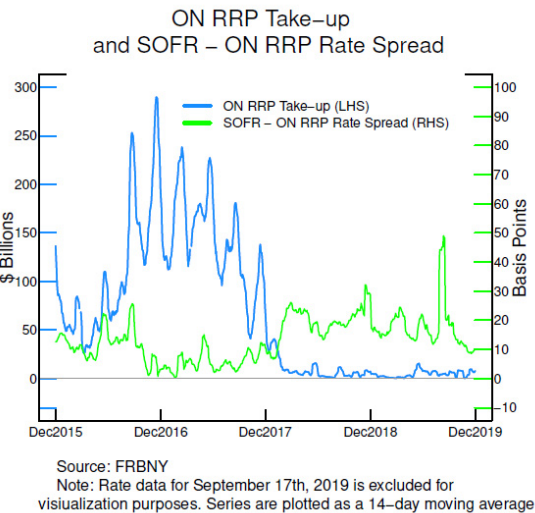


Figure 6



At the same time, notable growth occurred in substitute investments for the ON RRP, such as Treasury bills and private repo, helping to absorb these flows into MMFs. As a result, ON RRP usage declined (Figure 6). For example, private repo investment grew steadily during this tightening episode, as the private sector financed additional Treasury issuance amid large fiscal deficits and balance sheet runoff. Growing demand for funding in the repo market from dealers that borrow from MMFs, as well as declining aggregate reserves likely contributed to wider



spreads between repo rates and the ON RRP rate. With higher rates, MMFs' investment in repo with private counterparties grew.<sup>11</sup>

In an environment with higher market repo rates relative to ON RRP rate and greater availability of alternative investments, cash invested in the ON RRP declined substantially once balance sheet runoff was underway and stayed near zero.

#### **4. Baseline projections for bank deposit flows to MMFs and ON RRP take-up during 2022-24**

This section describes our methodology and shows quarterly projections for deposit flows to MMFs and ON RRP usage for the period 2022:Q2-2024:Q4. The historical series end in 2021:Q4.

##### *4.1. Projections for potential bank deposit flows to MMFs*

To estimate the potential flows of bank deposits to MMFs under expected FFR increases, we use the historical relationships described in Section 3.1 among the FFR, the spreads between MMF net yields and bank deposit rates, and the ratios of MMF shares to bank deposits held by financial institutions, non-financial corporates, and households. In addition, we take the median of the FFR modal path expected by respondents to the June 2022 Surveys of Primary Dealers and of Market Participants, which is conducted by the Trading Desk at the Federal Reserve Bank of New York to gain insights into market expectations.<sup>12</sup> Using the historical relationships and the expected FFR path, we project the associated widening in spreads and the increase in ratios from their most recent levels in 2021:Q4. Then we back out the projected bank deposit flows to MMFs from the projected ratio increases.<sup>13</sup>

---

<sup>11</sup> Growth in private repo activity also reflected structural shifts and innovations in money markets during this time. There was a large increase in the supply of funds available to invest in repo and other RRP alternatives as a result of the MMF reform measures that went into effect in late 2016, as roughly \$1 trillion moved from prime MMFs to government MMFs via direct flows and fund conversions in the year preceding the implementation. Government MMFs invest only in short-term Treasury and agency securities and repo, while prime MMFs invest primarily in unsecured credit products. In addition, as the Fixed Income Clearing Corp. (FICC) sponsored repo service was opened to MMFs in mid-2017, the FICC sponsored service came to represent a substantial part of the net growth in MMFs' private repo investment during the tightening episode, since sponsored repo offered MMFs a higher rate than other repo and was not limited by the balance sheet constraints of bank-affiliated dealers.

<sup>12</sup> See <https://www.newyorkfed.org/medialibrary/media/markets/survey/2022/jun-2022-spd-results.pdf> and <https://www.newyorkfed.org/medialibrary/media/markets/survey/2022/jun-2022-smp-results.pdf>.

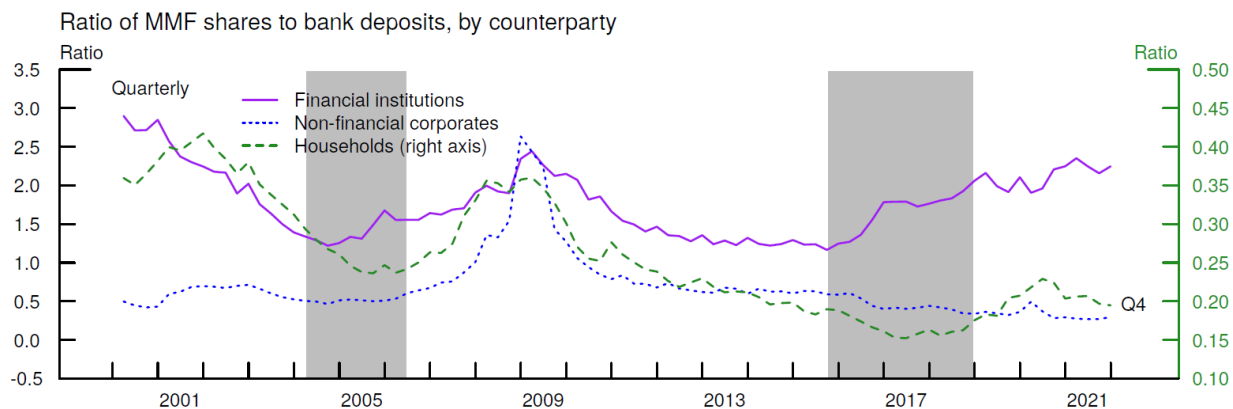
<sup>13</sup> To back out deposit flows from ratios, we assume that, in the absence of flows, MMF shares and bank deposits follow the same rate of trend growth ( $g$ ) and that flows occur at the beginning of each period. Then, given the current and projected ratios ( $R_0$  and  $R_1$ ), along with the current deposit amounts ( $BankDep_0$ ), we compute Flows, using  $R_0 = MMShares_0 / BankDep_0$  and  $R_1 = MMShares_1 / BankDep_1 = [ (1+g)*( MMShares_0 + Flows ) ] / [ (1+g)*( BankDep_0 - Flows ) ]$ .

Specifically, we use regression analysis to measure the historical relationship among the FFR, the spreads, and the ratios, separately for each counterparty. We first regress the institutional and retail spreads on the FFR, conditioning on episodes of FFR increases. Second, we regress the ratios of MMF shares to bank deposits on institutional or retail spreads, as relevant for each counterparty, over the full sample period using quarterly data from 2000:Q1 to 2021:Q4 and the following regression specification:

$$Ratio_t = \alpha + \beta Spread_t + \gamma Spread_t * Tighten_t + \delta Tighten_t + \varepsilon_t \quad (1)$$

We compute the ratios of MMF shares to bank deposits using data from the Financial Accounts of the U.S., the Z.1 statistical release as discussed earlier. The full time series are shown in Figure 7. We construct the spreads using weighted averages of retail and institutional MMF yields net of fees from iMoneyNet, Inc., as well as simple averages of retail and institutional deposit rates from S&P Global, SNL Depository Rates (RateWatch). We use institutional spreads separately for financial institutions and non-financial corporates, as well as retail spreads for households. To capture the lagged effects of spreads on ratios, we construct the explanatory variable as the five-quarter moving average of the spread taking its contemporaneous value and four lags.

Figure 7



Note: The shaded areas represent episodes of FFR increases during 2004q1-2006q2 and 2015q3-2018q4.  
Source: Financial Accounts of the U.S. data, the Z.1 statistical release, staff calculations..

The regression results suggest that the ratios for non-financial corporates, financial institutions, and households rose on average by 0.00474, 0.177, and 0.0245 for each 100-bps increase in the spread (Table 1). The coefficient estimates on the interacted terms are not statistically significant, suggesting that the sensitivity of ratios to spreads was not different during tightening episodes than otherwise.

Under the FFR path from the June 2022 Desk Survey for the 2022-24 period (about 300 bps increase above the Effective Lower Bound, see Figure 8.a) and using the regression analysis results, the projected flows from bank deposits to MMFs are about \$600 billion through 2024

(Figure 8.b). This amount is equivalent to 3 percent of current bank deposits held by the selected counterparties in our sample as of 2021:Q4.<sup>14</sup> The projected flows follow a time profile that reflects the FFR path and a two-quarter lagged effect of spreads on ratios.<sup>15</sup>

Figure 8.a

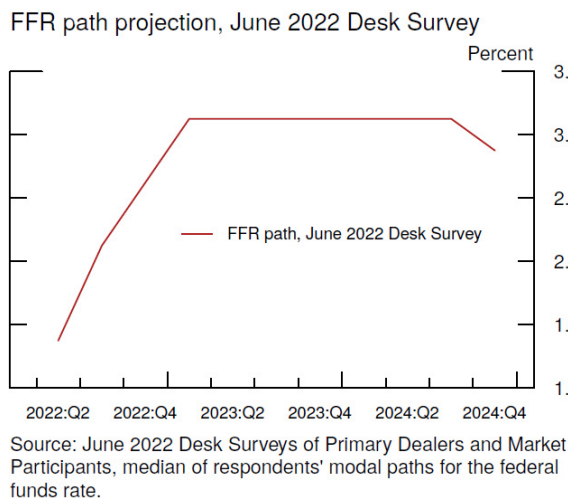
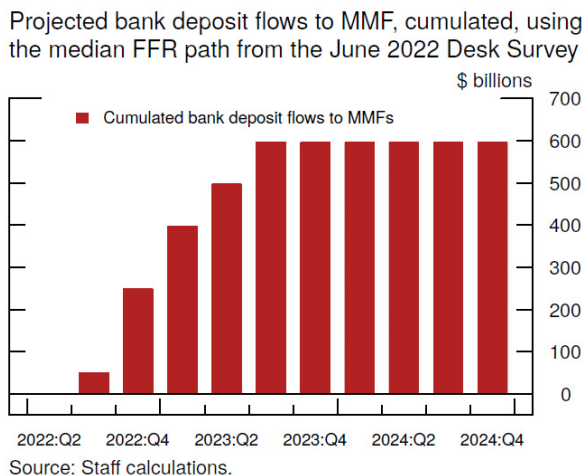


Figure 8.b



Alternatively, we project the flows of bank deposits to MMFs using the relationship between ratios and spreads observed specifically during past episodes of FFR increases as shown in Figure 4 (i.e., event-based approach), rather than the relationship implied by the regression analysis over the full sample period. Based on the 2004-06 episode, the ratios of non-financial corporates, financial institutions, and households rose by 0.0624, 0.1134, and 0.0106, respectively, for every 100 bps increase in the spread. Based on the 2015-18 episode, the ratios rose by 0.0282, 0.7034, and 0.0214 respectively for every 100 bps increase in the spread. Consistent with the regression analysis, the event-based approach suggests that the holdings of financial institutions were most responsive to spreads. However, in contrast to the regression analysis, the event-based approach suggests larger responses by non-financial corporates and smaller responses by households.

Using these event-based estimates for the relationship between ratios and spreads, our projected flows from bank deposits to MMFs are similar to the baseline projection from the regression-

<sup>14</sup> By comparison, we estimate that the flows from bank deposits into MMFs attributed to FFR increases amounted to about \$200 billion during the 2004-06 episode and \$350 billion during the 2015-18 episode, equivalent to 3 and 4 percent respectively of the initial bank deposits at the time.

<sup>15</sup> Our projections are sensitive to a number of assumptions incorporated in our methodology. First, we assume the changes in the ratio of MMF shares to bank deposits are fully explained by the past FFR increases and widening spreads, abstracting from confounding factors such as MMF reform or the introduction of the LCR requirement. Second, we assume that the historical sensitivity of the ratio to FFR increases holds at the current levels of bank deposits and MMF shares, separately for each counterparty. Third, we assume that the ratio sensitivity holds for the projected future increases in the FFR and remains constant for individual future FFR hikes through 2024.

based approach. The projected flows amount to about \$450 billion based on the 2004-06 episode and about \$700 billion based on the 2015-18 episode.<sup>16</sup>

Several confounding factors other than monetary policy may have affected the ratios of MMF shares to bank deposits over time, which should be considered when interpreting our regression results. For instance, the MMF reform in 2016 may have slowed the total inflows into MMFs or prompted modest net outflows from MMFs into LISCC bank deposits. Furthermore, the implementation of the Liquidity Coverage Ratio (LCR) requirement in 2015 may have prompted banks to retain more deposits as a stable source of funding, placing downward pressure on the ratios. For households, a secular increase in savings and time deposits has dampened the ratios. In addition, flows from riskier investments such as equities and mutual funds into government MMFs may have boosted the ratio during recessions and risk-off episodes, when monetary policy was eased.

#### 4.2 Projections for ON RRP take-up

To compute ON RRP take-up, we first project ON RRP take-up as a share of MMFs AUM, and then add in the MMFs' AUM increase resulting from the projected deposit flows described in Section 3.1.

First, we estimate the historical relationship between ON RRP take-up by MMFs (as a share of AUM) and the SOFR-ON RRP spread and net Treasury bill issuance.<sup>17</sup> We consider the previous tightening episode (October 2015-April 2018) and the more recent experience (April 2021-December 2021) using the following regression specification:

$$(ONRRP\ take-up/AUM)_t = \alpha + \beta (SOFR-ONRRP)_t + \gamma NetTreasBill_t + \varepsilon_t \quad (2)$$

Table 2 shows regression results for the previous episode (October 2015-April 2018) and the recent period (April 2021-December 2021).<sup>18</sup> Regression results suggest that ON RRP take-up decreases as the SOFR-ON RRP spread widens and as net Treasury bill issuance increases.<sup>19</sup>

We then project ON RRP take-up by MMFs (as a share of AUM) using two inputs: 1) projected SOFR-ON RRP spread, and 2) the Federal Reserve staff forecast for net Treasury bill issuance.

---

<sup>16</sup> Given that in some cases we use the minimum and maximum ratios from each episode, instead of the start and end-date ratios, the event-based projections may be an upper bound, such as those based on the 2015-18 episode.

<sup>17</sup> Relationship lending between MMFs and dealers also affects ON RRP take-up (Han et.al., 2022). The aggregate net effect of such relationships is imbedded in the estimated coefficients in regression (2).

<sup>18</sup> As discussed in section 2, after balance sheet run off began in October 2017, ON RRP take-up declined and reached almost zero by April 2018. It consistently remained at that level until April 2021. ON RRP take-up by MMFs as a share of MMFs' AUM for the period April 2021-December 2021 is not a stationary series. For the April 2021-December 2021 period we make two alternative modifications: 1) add the lagged series of  $(ONRRP\ take-up/AUM)$ ; and 2) estimate the first difference of  $(ONRRP\ take-up/AUM)$ .

<sup>19</sup> Anderson and Huther (2016) also find similar results from their panel data analysis using daily data at the counterparty level for the period December 2013-November 2014.

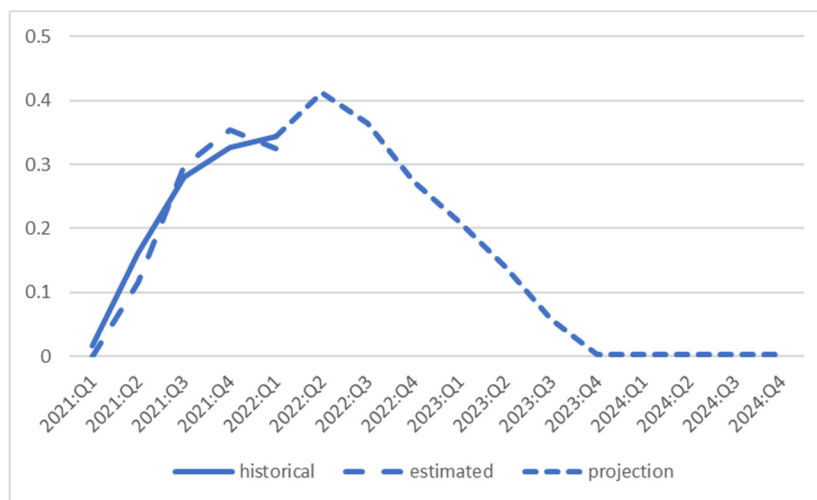
We estimate the historical relationship between the SOFR-ON RRP spread and policy tightening using data for the period October 2015-December 2021 and the following regression specification:

$$(SOFR-ONRRP)_t = \alpha + \beta (FFR)_t + \gamma \Delta SOMA_t + \varepsilon_t \quad (3)$$

Regression results are shown in Table 3. The estimated coefficients have the expected sign, suggesting that the SOFR-ONRRP rate spread increases with the increase in the FFR (rate tightening) and with the decrease in SOMA holdings (quantitative tightening).<sup>20</sup> Projected SOFR-ONRRP rate spread is then derived based on the estimated historical relationship and the expected path of policy tightening, where the expected FFR path that we use is based on the June 2022 Desk Survey and the Fed’s projected balance sheet runoff path follows the May 4, 2022 announcement on “Plan for Reducing the Size of the Federal Reserve Balance Sheet”.<sup>21</sup>

As shown in Figure 9, ON RRP take-up as a share of MMFs’ AUM is projected to increase in 2022:Q2 and to remain elevated, at around 30 percent, through 2022. This is mostly driven by lower net bill issuance, which is projected to decline in 2022:Q2. In 2023, ON RRP take-up as a share of MMFs AUM is projected to decline with further increases in the SOFR-ON RRP spread and in net Treasury bill issuance and to reach near zero in late-2023.

Figure 9: ON RRP take-up by MMFs as share of MMFs AUM: historical, estimated and projected values



Source: Staff projections and Federal Reserve Bank of New York (historical).

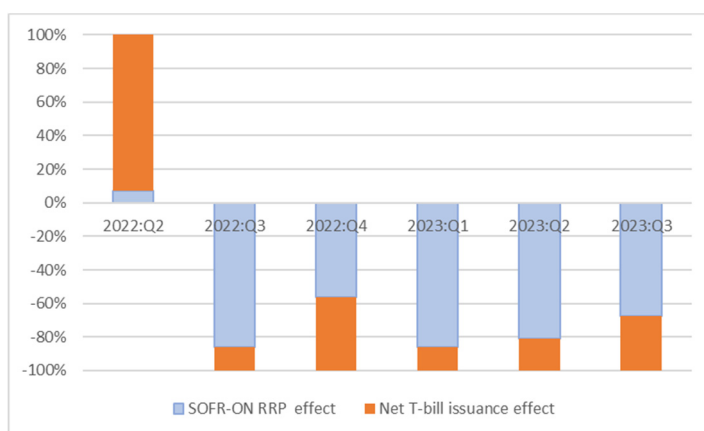
Note: This figure plots ON RRP take-up by MMFs as a share of MMFs AUM: historical (solid line); estimated (dashed line), projections (dotted line). Projections are based on the historical relationship between MMFs allocation at the ON RRP facility, the SOFR-ONRRP rate spread and net Treasury bill issuance and projected SOFR-ONRRP rate spread and projected net Treasury bill issuance.

<sup>20</sup> We also considered a regression specification which includes net Treasury bill issuance, but the estimated coefficient was not significant. Regression results are shown in Table 3.

<sup>21</sup> See “[Plans for Reducing the Size of the Federal Reserve's Balance Sheet](#)” for details.

The relative contributions of the SOFR-ON RRP spread and net Treasury bill issuance on the path of ON RRP take-up by MMFs as a share of AUM are shown in Figure 10. We find that net Treasury issuance mainly influences the projection for ON RRP take-up in the very near term and the SOFR-ON RRP spread mainly influences the take-up projection in subsequent quarters.

Figure 10: Relative contribution of projected SOFR-ONRRP spread and net Treasury bill issuance to changes in projected ON RRP take-up by MMFs as a share of MMFs AUM



Source: Staff projections.

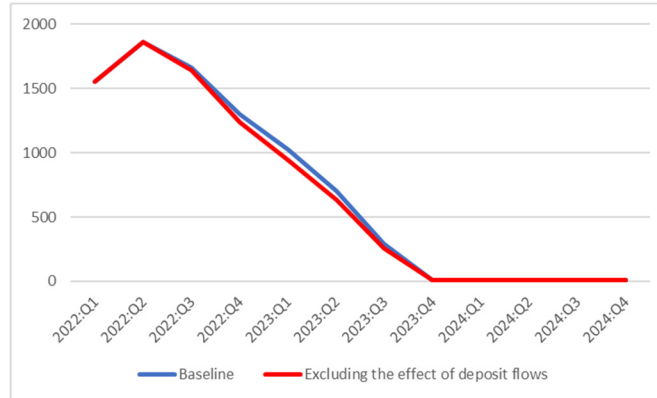
Note: This figure plots the relative contribution of SOFR-ONRRP spread (blue bars) and net Treasury bill issuance (orange bars) to changes in projected ON RRP take-up by MMFs as a share of MMFs AUM.

Next, we use the projected ON RRP take-up by MMFs as a share of MMFs AUM and we factor in the fact that MMFs’ AUM grow with the inflows from bank deposits projected in Section 4.1. ON RRP take-up by MMFs, shown by the blue line in Figure 9, is projected to be above \$1 trillion through the end of 2022. The red line shows projected ON RRP take-up excluding the contribution of deposit flows. The proximity of the two lines illustrates that the influence of deposit flows on ON RRP take-up is projected to be small.

Specifically, our projections suggest that, of the about \$600 billion of potential deposit flows to MMFs, about \$100 billion are projected to flow into the ON RRP through the end of 2024, which represents about 7 percent of the May 2022 ON RRP take-up by MMFs. Furthermore, quarterly flows, at their highest, are at the upper bound of the range of daily fluctuations in ON RRP take-up.

Similar to deposit flows, related flows into the ON RRP also peak in the last quarter of 2022. However, while we project a bank deposits to continue to flow into MMFs until 2023:Q4, related flows into the ON RRP are declining, reflecting the decline in MMFs’ allocations into the ON RRP as monetary policy tightening continues. The projected path of ON RRP take-up is then mostly driven by how MMFs allocate their portfolios rather than by the size of their AUM.

Figure 11: Projected ON RRP take-up by MMFs



Source: Staff projections.

Note: This figure plot projected ON RRP take-up by MMFs. The blue line shows projected ON RRP take-up by MMFs assuming MMFs AUM grow with projected deposit flows as in Section 3. The red line shows projected ON RRP take-up excluding the contribution of deposit flows. ON RRP take-up by MMFs for 2022:Q1 is historical and it is shown as a reference.

## 5. Upside risks to ON RRP take-up projections

We discuss upside risks to our baseline estimates of ON RRP take-up arising from (1) larger bank deposit flows to MMFs, and (2) a higher share of MMFs’ portfolios invested at the ON RRP. We show that the larger bank deposit flows would only have a moderate impact on MMFs’ ON RRP take-up. However, a lower SOFR-ONRRP spread or lower net Treasury bill issuance than in our baseline projections could have substantial effects on ON RRP take-up.

### 5.1. Larger bank deposit flows into MMFs

There are several reasons that bank deposit flows could be larger during the current tightening cycle. First, banks accumulated large amounts of deposits during the Covid-19 pandemic crisis, amid the increase in reserve balances associated with the Fed’s asset purchases, fiscal stimulus, and higher savings rates (Castro, Cavallo, Zarutskie, 2022). Second, banks’ net interest margins (NIMs) are currently more depressed than in 2015. Given the abundance of bank deposits and the compressed NIMs, banks may raise deposit rates more slowly in response to FFR increases, or deposit holders may be more sensitive to widening spreads, which could enhance the deposit flows to MMFs. Third, as the balance sheet runoff starts sooner, MMF yields could increase by more due to increasing investment opportunities such as private repo, prompting more inflows

from bank deposits.<sup>22</sup> These factors could lead to wider spreads or a greater sensitivity of bank deposits to spreads.

We consider two alternative scenarios:

- Alternative 1: The MMF yield-deposit rate spread widens more in response to FFR increases than in the baseline projections. Specifically, we calibrate the sensitivity of bank deposit rates to the FFR to be half that of our baseline analysis and the sensitivity of MMF yields to be 50 percent higher, so the spread widens by about 120 bps for every 100 bps of FFR increases. As a result, we project flows of about \$1,150 billion or 6 percent of the current bank deposits (Figure 12.a, orange bars), almost double than our baseline projections (blue bars).
- Alternative 2: The ratios of MMF shares to bank deposits are more sensitive to interest rates than in the baseline scenario. We calibrate households and non-financial corporates to have the maximum historical sensitivity displayed by non-financial corporates during the 2004-06 episode. As a result, we project flows of \$1,550 billion or 9 percent of bank deposits (Figure 12.a, grey bars), more than double than our baseline projections (blue bars). We consider these two scenarios to be mutually exclusive, i.e., if counterparties become more sensitive to the spread, the spread may widen by less as banks raise deposit rates by more to retain deposits.

These scenarios suggest that corresponding flows into the ON RRP could be up to 2.5 times as large as our baseline, but the overall effect on ON RRP take-up would still be moderate. Specifically, the larger deposit flows could boost take-up by as much as 18 percent of MMFs' May 2022 take-up (compared to 7 percent in our baseline projections). The additional take-up is shown by the orange and grey lines in Figure 12.b, compared to the baseline take-up shown by the blue line.

---

<sup>22</sup> However, several other factors could slow the bank deposit flows relative to 2015-18. The shares of more interest-rate sensitive deposits, including non-operational deposits and deposits held by non-bank financial institutions, in the total deposits at the U.S. G-SIBs are somewhat smaller today than in late-2015. (Based on FR 2052 data, they fell from 19 to 17 percent and from 21 to 18 percent, respectively, between December 2015 and February 2022). In particular, the share of non-operational deposits in the total deposits held by non-supervised financial institutions at G-SIBs fell (from 42 to 33 percent). Furthermore, once the balance sheet runoff begins and the amount of reserves in the banking system declines, banks may become more concerned with retaining deposits for liquidity purposes, since the LCR requirements are fully implemented now compared to 2015.



Figure 12.a: Projected bank flows to MMFs

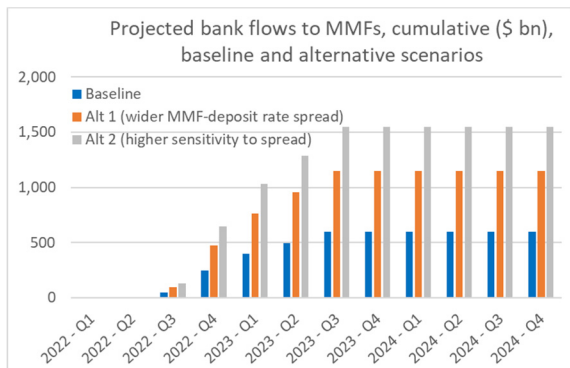
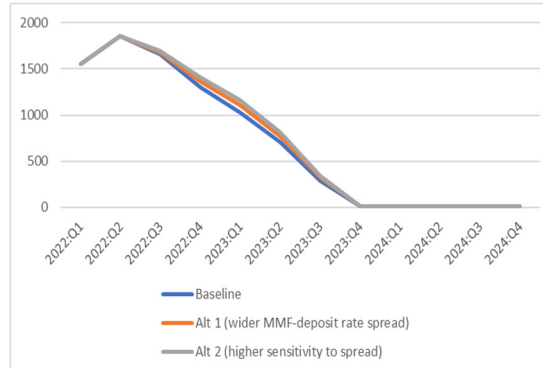


Figure 12.b: Projected ON RRP take-up by MMFs



Source: Staff projections.

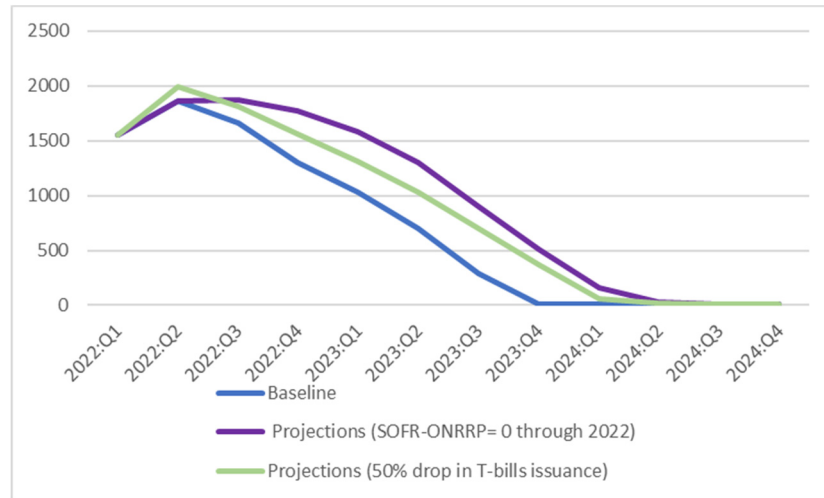
Note: These figures plot projected bank flows to MMFs (Figure 12.a) and ON RRP take-up by MMFs (Figure 12.b) under the baseline scenario (the blue line) and alternative scenarios representing upside risk to bank flows to MMFs: 1) a scenario of wider MMF yield-deposit rate spread (in orange), and 2) a scenario of higher sensitivity to the MMF yields-deposit rate spread (on grey). ON RRP take-up by MMFs for 2022:Q1 is historical and it is shown as a reference.

## 5.2. Higher share of ON RRP in MMFs portfolio

We consider two additional scenarios that would lead to a higher projected share of ON RRP in MMFs’ portfolio: First, SOFR trading at the ON RRP rate for an extended time (through 2022) and second, net Treasury bill issuance lower than projected (a 50% drop in T-bill issuance).

Figure 13 plots projected ON RRP take-up by MMFs for these alternative scenarios along with our baseline projections. In the first scenario, ON RRP take-up by MMFs would continue to increase and hover around \$1.8 trillion through the end of 2022 (Figure 13, purple line). The effect of the second scenario’s lower Treasury bill issuance (Figure 13, green line) is somewhat smaller, as the baseline increase in net Treasury bill issuance is relatively small compared to the level of ON RRP take-up, but still implies a substantial deviation from the baseline projection. In either of these cases, ON RRP take-up would likely be larger and could remain close to recent levels throughout 2022.

Figure 13: Projected ON RRP take-up by MMFs (\$ bill)



Source: Staff projections

Note: This figure plot projected ON RRP take-up by MMFs under the baseline scenario (the blue line) and alternative scenarios representing upside risk to ON RRP take-up by MMFs. The purple line plots projected ON RRP take-up by MMFs under a scenario of SOFR trading at the ONRRP offering rate through 2022. The green line plots the projected ON RRP take-up by MMFs under a scenario of a 50 percent drop in net Treasury bill issuance through 2024. ON RRP take-up by MMFs for 2022:Q1 is historical and it is shown as a reference.

## 6. Conclusion

Based on the historical experience from past monetary tightening cycles and using the future path of the FFR from the June 2022 Desk Survey, we project that the flows from bank deposits to MMFs would be relatively small through 2024, in line with the flows observed during past episodes of FFR increases. The resulting flows to the ON RRP facility would also be relatively small. Instead, other factors such as the private demand for repo funding and the net supply of Treasury bills are expected to have more substantial effects on ON RRP take-up than the flows from bank deposits to MMFs.

Importantly, there is considerable uncertainty around our projections, given differences between the current tightening cycle and the past. To take this uncertainty into account, we show that under alternative scenarios, bank deposit flows could be larger or MMFs’ portfolio allocation at the ON RRP facility could be higher than our baseline projections. However, we find that the most substantial changes to our baseline estimates of ON RRP take-up would arise from lower-than-projected rates for private repo funding or a lower-than-projected net Treasury bill issuance, rather than from the factors shaping the flows from bank deposits to MMFs.

## References

Anderson, Alyssa, and Jeffrey Huther (2016). “Modelling Overnight RRP Participation,” Finance and Economics Discussion Series 2016-023. Washington: Board of Governors of the Federal Reserve System, <http://dx.doi.org/10.17016/FEDS.2016.023>

Castro, Andrew, Michele Cavallo, and Rebecca Zarutskie (2022). "Understanding Bank Deposit Growth during the COVID-19 Pandemic," FEDS Notes. Washington: Board of Governors of the Federal Reserve System, June 06, 2022, <https://doi.org/10.17016/2380-7172.3133>.

Drechsler, Itamar, Alexi Savov, and Philipp Schnabl (2017). “The Deposits Channel of Monetary Policy,” *The Quarterly Journal of Economics*, Volume 132, Issue 4, November 2017, Pages 1819–1876, <https://doi.org/10.1093/qje/qjx019>.

Driscoll, John C. and Ruth Judson (2013). "Sticky Deposit Rates," Finance and Economics Discussion Series 2013-80, Board of Governors of the Federal Reserve System (U.S.).

Neumark, David and Steven A. Sharpe (1992). “Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits Get access Arrow,” *The Quarterly Journal of Economics*, Volume 107, Issue 2, May 1992, Pages 657–680, <https://doi.org/10.2307/2118485>

Han, Song, Kleopatra Nikolaou, and Manjola Tase (2022). “Trading relationships in secured markets: Evidence from triparty repos,” *Journal of Banking & Finance*, Volume 139, 2022, <https://doi.org/10.1016/j.jbankfin.2022.106486>.

## Appendix: Data Sources

EFFR: Federal Reserve Bank of New York

Bank deposit rates: S&P Global, SNL Depository Rates (RateWatch)

MMFs asset under management, yields net of fees: iMoneyNet, Inc.

ON RRP take up: Federal Reserve Bank of New York

SOFR: Federal Reserve Bank of New York

Bank deposits, MMF share amounts: Financial Accounts of the U.S., the Z.1 statistical release

Table 1 Regression results, MMF shares/bank deposit ratios on MMF yields-deposit rate spreads

VARIABLES	(1) Ratio, non-financial corporates	(2) Ratio, corporates	(3) Ratio, financial institutions	(4) Ratio, financial institutions	(5) Ratio, households	(6) Ratio, households
Spread_institutional	0.00474 (0.0415)	0.000473 (0.0428)	0.177*** (0.0385)	0.174*** (0.0389)		
Spread_institutional*Tighten		-0.00749 (0.127)		-0.0215 (0.115)		
Spread_retail					0.0245*** (0.00706)	0.0239*** (0.00678)
Spread_retail*Tighten						-0.0222 (0.0205)
Observations	88	88	88	88	86	86
R-squared	0.000	0.084	0.197	0.292	0.113	0.404

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The explanatory variables is constructed as an average of the current and four lags of the spread.

Coefficients on indicator variables for tightening episodes and constant not reported.

Table 1 shows regression results from estimating the historical relationship between the ratio of MMF shares to bank deposits and the spread between MMF yields net of fees and bank deposit rates, separately for the holdings of non-financial corporates, financial institutions, and households, using quarterly data from 2000:Q1 to 2021:Q4. We use institutional spreads separately for financial institutions and non-financial corporates, and retail spreads for households. To capture lagged effects of the spreads on ratios, we use the five-quarter moving average of the spread taking its contemporaneous value and four lags as the explanatory variable.

Table 2 Regression results: ON RRP take-up by MMFs as a share of MMFs AUM

	(1)	(2)	(3)
weekly data	Oct. 2015- Apr.2018	Apr.2021-Dec. 2021	Apr.2021-Dec. 2021
variables	RRP take-up/AUM	RRP take-up/AUM	D.( RRP take-up/AUM)
SOFR -ONRRP (bps)	-0.000866* (0.000522)	-0.00699* (0.00350)	-0.00222 (0.00292)
NetTreasBills (\$ bill)	-0.000171*** (5.54e-05)	-0.000135*** (3.61e-05)	-0.000145*** (3.35e-05)
L.( RRP take-up/AUM)		0.964*** (0.0241)	
Constant	0.0507*** (0.00495)	0.0132** (0.00583)	0.00521** (0.00199)
Observations	127	39	39
R-squared	0.108	0.988	0.265

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2 shows regression results estimating the historical relationship between ON RRP take-up by MMFs as a share of AUM, SOFR-ON RRP spread and net Treasury bill issuance. The table shows regression results separately for two periods (the previous episode (October 2015-April 2018) and recent period (April 2021-December 2021)) and two specifications (level and changes for ON RRP/AUM).

Table 3: Regression results: SOFR-ONRRP spread

weekly data variables	Oct.2015-Dec.2021 SOFR-ONRRP (bps)	Oct.2015-Dec.2021 SOFR-ONRRP (bps)
FFR (bps)	0.0514*** (0.00433)	0.0512*** (0.00432)
D.SOMA (\$ bill)	-0.0192*** (0.00562)	-0.0217*** (0.00747)
NetTreasBill (\$bill)		0.00629 (0.00683)
Constant	5.952*** (0.606)	5.950*** (0.606)
Observations	326	326
R-squared	0.309	0.310

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3 shows regression results estimating the historical relationship between SOFR-ON RRP spread and rate tightening (measured by FFR) and quantitative tightening (change in SOMA holdings).