The Money Market Mutual Fund Liquidity Facility

Kenechukwu Anadu, Marco Cipriani, Ryan Craver, and Gabriele La Spada

OVERVIEW

- On March 20, amid the onset of the COVID-19 pandemic, the Federal Reserve, with prior approval from the U.S. Treasury Secretary, established the Money Market Mutual Fund Liquidity Facility (MMLF). Under the facility, the Federal Reserve Bank of Boston made loans to eligible banks, secured by high-quality assets purchased from eligible MMFs.
- The goals of the MMLF were to help MMFs meet heightened redemptions and runs, to stabilize U.S. short-term funding markets, and to support the provision of credit to the real economy. In total, the facility extended about $58 billion in credit.
- The authors first discuss the run on MMFs and then describe the MMLF's design, operations, and usage. Then, they identify the facility's effect on investor flows and market prices. Their analysis shows that the MMLF was an important tool in reducing runs on prime MMFs and stabilizing the U.S. short-term funding markets at large.

In March 2020, at the onset of the COVID-19 pandemic, investors redeemed their shares en masse from both domestic and offshore dollar-denominated prime money market funds (MMFs).[1] Relative to the size of the prime MMF industry, the run was remarkably similar to the run that took place in September 2008, during the global financial crisis, notwithstanding the starkly different natures of the shocks that precipitated the two episodes. As was the case in 2008, the 2020 run amplified strains in the short-term funding markets, a key source of liquidity for businesses, as rates on several money market securities increased steeply.

In mid-March, the Federal Reserve, with the approval of the Secretary of the Treasury, established the Money Market Mutual Fund Liquidity Facility (MMLF) to assist MMFs in meeting heightened investor redemptions, stabilize U.S. short-term funding markets, and support the provision of credit to the real economy. Under the facility, which was similar in structure and purpose to the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) established in 2008, the Board of Governors

Kenechukwu Anadu is a vice president in the Federal Reserve Bank of Boston's Supervision, Regulation, and Credit Department. Marco Cipriani is head of Money and Payments Studies and Gabriele La Spada a financial research economist in the Federal Reserve Bank of New York's Research and Statistics Group. At the time this article was written, Ryan Craver was a senior research analyst in the Research and Statistics Group. Emails: ken.anadu@bos.frb.org, marco.cipriani@ny.frb.org, gabriele.laspada@ny.frb.org.

authorized the Federal Reserve Bank of Boston to make nonrecourse loans to eligible banks to facilitate the purchase of eligible assets from domestic prime MMFs and tax-exempt MMFs.[2]

In this article, we discuss the March 2020 run on MMFs, describe the design and operations of the MMLF, and assess the facility's effectiveness in stemming fund outflows and calming money market rates. First, we discuss the reasons why investors ran and document the dislocations in money market rates that accompanied the run. As shown in Cipriani and La Spada (2020) and Li et al. (2020), institutional investors ran more from funds for which the imposition of redemption gates and liquidity fees—introduced by the 2014 SEC reform—was more likely due to lower levels of weekly liquid assets (WLA) in their portfolios. The outflows of retail investors, in contrast, were unrelated to fund-level liquidity and reflected other factors, including contagion from the behavior of institutional investors within the same fund family.

Second, we describe the structure of the MMLF and compare it with that of the AMLF, highlighting similarities and differences. Both facilities used banks as a conduit to provide liquidity to domestic prime (and, for the MMLF, also tax-exempt) MMFs. A material difference, however, is that the AMLF facilitated banks' purchases of only asset-backed commercial paper (ABCP) from MMFs, whereas the MMLF made loans against a broader set of assets.

Third, we describe the usage of the MMLF. We show that it was used more by funds that suffered larger outflows, and that funds sold securities with longer maturities, consistent with their incentive to boost their liquidity positions, especially their WLA.[3]

Finally, we identify the effect of the MMLF on investor flows by showing that, after the facility's introduction, outflows from prime MMFs decreased more for those funds that were eligible to participate in the MMLF program (that is, domestic MMFs), for those that had a larger share of illiquid securities, and for those whose investors were more concerned about the funds' liquidity (that is, institutional MMFs). Moreover, we show that, after the introduction of the MMLF, the rates of MMLF-ineligible securities declined more slowly than those of MMLF-eligible securities, even after controlling for credit risk.

Overall, our analysis shows that, like the AMLF in 2008, the MMLF was an important tool in stabilizing prime MMFs and short-term funding markets at large.

1. Background on Money Market Funds

1.1 Domestic Funds

Domestic MMFs are U.S.-domiciled, open-end mutual funds that invest primarily in U.S. dollar-denominated money market instruments with short maturity and high credit quality. There are two main types of domestic MMFs: (1) government funds, which invest almost all their assets in U.S. government and agency securities and in repurchase agreements (repos) backed by those securities; and (2) prime funds, which can also buy private unsecured debt such as certificates of deposit (CDs), commercial paper (CP), and variable-rate demand notes (VRDNs), in addition to ABCP. At the end of 2019, domestic MMFs had $4.3 trillion in total net assets, 69 percent held by government funds and 28 percent by prime funds.[4]

Domestic MMFs can also be divided by investor type: retail fund shares can be sold only to "natural persons," whereas institutional funds are also available to institutions, such as businesses and governments.

Domestic MMFs are regulated by the SEC under Rule 2a-7 of the Investment Company Act of 1940; this rule places limits on the credit risk, liquidity risk, maturity, and concentration of the funds' portfolios. In response to the 2008 run on prime MMFs, the SEC adopted a set of reforms in 2014 to improve the resilience of prime MMFs and reduce the likelihood of runs.[5]

The 2014 reform changed how prime MMFs sell and redeem shares, thereby directly affecting their runnability. The SEC required that all prime MMFs adopt a system of redemption gates and liquidity fees contingent on the level of weekly liquid assets in their portfolios: if a fund's WLA falls below 30 percent of its total assets, the fund is allowed (but not required) to impose a liquidity fee of up to 2 percent on all redemptions or to temporarily suspend redemptions for up to ten business days; if a fund's WLA fall below 10 percent, the fund must impose a fee of 1 percent unless its board determines that doing so is not in the interests of the fund's shareholders.[6]

Additionally, the SEC required that institutional prime MMFs sell and redeem their shares at a price that reflects the market value of the fund's underlying securities (floating net asset value, or floating NAV); that is, institutional investors can no longer buy and redeem their shares at a stable NAV (typically $1 per share) as they had previously done and as retail prime investors can still do. Government MMFs were largely unaffected by the 2014 reform.

1.2 Offshore Funds

Offshore MMFs are European-domiciled, open-end funds that, like domestic MMFs, invest in U.S. dollar-denominated money market instruments and can be divided into government and prime funds based on their portfolio holdings.[7] Unlike domestic MMFs, however, offshore MMFs are almost exclusively held by institutional investors.[8]

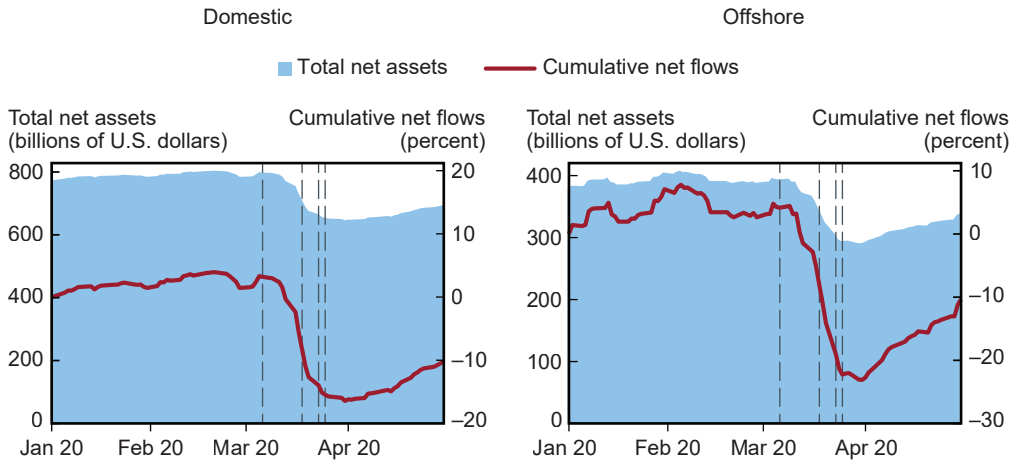
Offshore MMFs are regulated under Regulation (EU) 2017/1131 of the European Parliament and of the Council of the EU, which was also adopted in response to the run experienced by offshore MMFs in 2008. Similarly to the 2014 SEC reform, this new rule introduced a system of redemption gates and liquidity fees contingent on the level of liquidity in the fund's portfolio for the subset of offshore prime funds that are allowed to transact at a stable NAV (low-volatility NAV funds).[9]

2. The March 2020 Run

2.1 Fund Flows

Starting on March 6, 2020, when the COVID-19 pandemic became of increasing concern in the United States and Europe, domestic and offshore prime MMFs began experiencing outflows that quickly accelerated over the next several days.[10] These outflows slowed

Chart 1
Prime-MMF Outflows, January-April 2020



Sources: iMoneyNet; staff calculations.

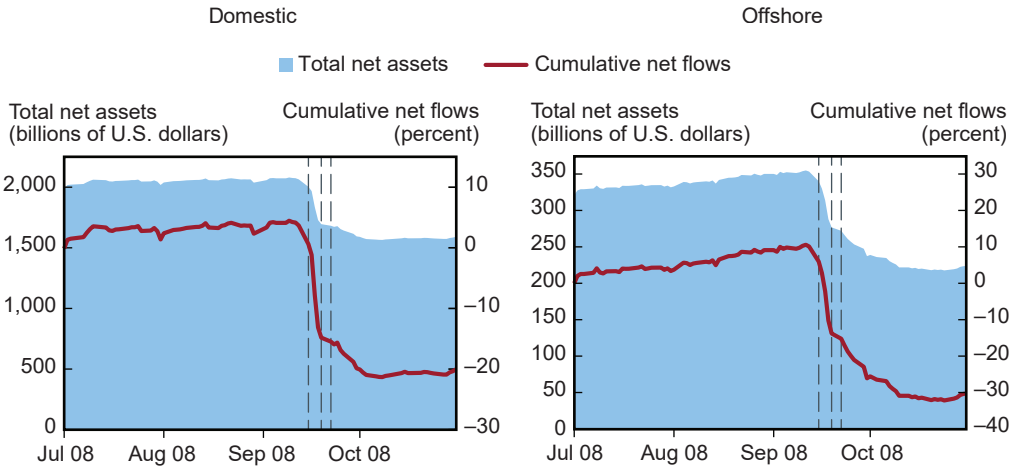
Notes: The chart shows total net assets in billions of U.S. dollars and cumulative net flow relative to December 2019 in percent for domestic prime funds (left panel) and offshore prime funds (right panel) from January to April 2020. Vertical lines show March 6 (beginning of the 2020 run), March 18 (MMLF announcement), March 23 (MMLF opening), and March 25 (when the MMLF started accepting CDs and VRDNs as collateral).

significantly after the Federal Reserve established the MMLF in mid-March. Between March 6 and March 26, domestic funds lost $143 billion, or 19 percent of the industry's assets in December 2019 (Chart 1, left panel). These outflows are comparable to those suffered by domestic prime MMFs during the September 2008 run, when their assets dropped by 18 percent relative to August (see Chart 2). The experience for offshore prime MMFs was similar to that of domestic funds: they lost $100 billion over the March 6-26 period, corresponding to 27 percent of their assets in December 2019 (Chart 1, right panel).

The March 2020 and September 2008 runs share two other important similarities. First, in both cases, outflows from prime MMFs were accompanied by large inflows into government MMFs, which represent a safe haven for investors. The assets of domestic government MMFs increased by $827 billion (31 percent) in March 2020 and by $334 billion (36 percent) in September 2008. Similar inflows were observed into offshore government funds, both in March 2020 (70 percent) and in September 2008 (65 percent).

Second, during both runs, institutional prime funds experienced larger outflows than retail prime funds. Between March 6 and March 26, 2020, outflows from domestic institutional funds had reached 33 percent of their assets in December 2019; outflows from domestic retail funds were only 10 percent of their December 2019 assets. In other words, institutional investors seem to be quicker to move their money in times of uncertainty.

Chart 2
Prime-MMF Outflows, July-October 2008



Sources: iMoneyNet; staff calculations.

Notes: The chart shows total net assets in billions of U.S. dollars and cumulative net flow relative to June 2008 in percent for domestic prime funds (left panel) and offshore prime funds (right panel) from July to October 2008. Vertical lines show September 15 (beginning of the 2008 run), September 19 (AMLF announcement), and September 22 (AMLF opening).

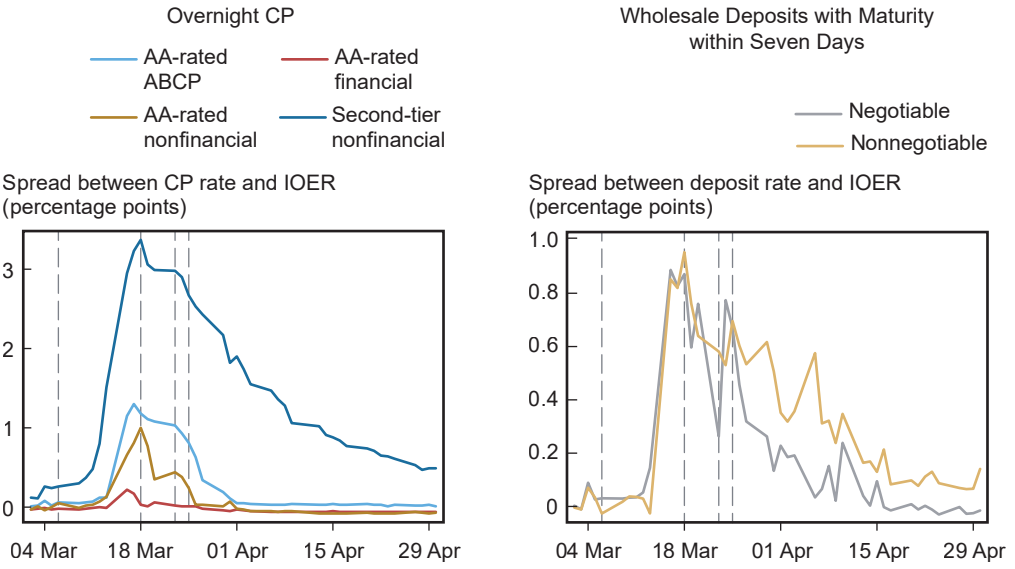
2.2 Money Market Rates

Large outflows from prime MMFs were accompanied by price dislocations in money market rates. Between March 6 and March 18, before the announcement of the MMLF, the spreads between several secondary market rates and the interest rate on excess reserves (IOER) rose markedly (Chart 3, left panel). The spreads for overnight AA-rated ABCP and AA-rated nonfinancial CP increased by 1.1 and 1.0 percentage points, respectively. The effect on second-tier nonfinancial CP was even stronger, with the spread reaching 3.2 percentage points on March 17. Not all money market rates increased by the same amount: for instance, the increase in the spread of overnight AA-rated financial CP was a modest 0.05 percentage point.

These price dislocations were very large by historical standards and comparable to those observed during the 2008 crisis. On September 16, 2008, the day the Reserve Primary Fund "broke the buck," the spreads between the rates of overnight AA-rated ABCP and second-tier nonfinancial CP and the target effective federal funds rate surged to 3.6 and 3.8 percentage points.11 Similar, although smaller, rate spikes also occurred for AA financial and nonfinancial CP.

Rates on CDs also increased sharply in March 2020 to then retrace their paths after the MMLF was introduced. As the right panel of Chart 3 shows, rates on both negotiable CDs and nonnegotiable deposits with remaining maturity within seven days spiked in the week ahead of the MMLF introduction, when MMFs suffered the largest outflows.

Chart 3
Dislocation in Money Market Rates in 2020: Spreads Relative to IOER



Sources: Federal Reserve Board of Governors; Federal Reserve Bank of St. Louis, FRED database; FR2420, *Report of Selected Money Market Rates*; staff calculations.

Notes: The left panel shows the daily average spread between several overnight CP rates (AA ABCP, AA financial CP, AA nonfinancial CP, and second-tier nonfinancial CP) and the IOER in percentage points from March to April 2020. The right panel shows the daily average spread relative to IOER for negotiable CDs and nonnegotiable deposits (CDs and TDs) with maturity within seven days. Vertical lines show March 6 (beginning of the 2020 run), March 18 (MMLF announcement), March 23 (MMLF opening), and March 25 (when the MMLF started accepting CDs and VRDNs as collateral).

2.3 The Role of WLA

Several recent papers have suggested that one of the reasons investors ran from prime MMFs in March 2020 was the fear that redemption gates and liquidity fees would be imposed under the terms of the 2014 SEC reform.[12] Cipriani and La Spada (2020) and Li et al. (2020) find that institutional funds with lower weekly liquid assets—and therefore, for which the imposition of gates and fees was more likely—experienced significantly larger outflows. For domestic institutional funds, Cipriani and La Spada (2020) find that a 10 percentage point decrease in a fund's WLA at the end of 2019 (that is, before the run started) increases daily outflows during the COVID-19 run by 1.1 percentage points. Results from Li et al. (2020) are similar.

Investor concerns around the imposition of gates or fees were not the only cause behind the large outflows observed in March 2020. MMFs are vulnerable to runs because they perform liquidity transformation and cater to investors with low risk tolerance. Among offshore MMFs, Cipriani and La Spada (2020) show that contagion within fund families also played a role: outflows from offshore prime MMFs were larger for those funds in families

also offering domestic institutional prime funds; in other words, there was a cross-border spillover from U.S. to European prime MMFs within the same family. Outflows from other types of mutual funds without fees and gates, such as ultrashort bond funds, were also very large in March.

Importantly, outflows from retail prime MMFs were not affected by funds' WLA (and the likelihood of gates and fees) but likely reflected other vulnerabilities. For instance, Cipriani and La Spada (2020) show that retail funds suffered larger outflows if they belonged to families also offering domestic institutional prime funds. This evidence of within-family contagion is consistent with less sophisticated retail investors using the actions of more sophisticated institutional investors in their own fund family as a signal.

3. The Money Market Mutual Fund Liquidity Facility (MMLF)

3.1 The Facility

On March 18, 2020, the Federal Reserve—with the approval of the Secretary of the Treasury and $10 billion in credit protection from the Exchange Stabilization Fund—announced the introduction of the MMLF to provide liquidity to MMFs.[13] In designing the facility, the Federal Reserve had to address two challenges. One challenge is the need to protect itself from credit risk, for example by offering loans only against high-quality collateral. Another challenge is fact that lending to MMFs would increase their leverage, thereby amplifying any losses for shareholders and increasing their incentive to run.

The Federal Reserve had faced the same challenges in 2008, when it set up the AMLF in response to the MMF run triggered by Lehman Brothers' default. Although the type of shock was different, it was natural to design the 2020 facility based on its 2008 predecessor.

Through the MMLF, which was established under the authority of Section 13(3) of the Federal Reserve Act, the Federal Reserve Bank of Boston made nonrecourse loans to eligible borrowers, taking as collateral eligible assets purchased by the borrowers from eligible MMFs. The eligible borrowers were U.S. depository institutions, U.S. bank holding companies (parent companies incorporated in the United States or their U.S. broker-dealer subsidiaries), and U.S. branches and agencies of foreign banks. Eligible collateral was limited to U.S. Treasury securities and fully guaranteed agency securities, government-sponsored enterprise (GSE) securities, highly rated CP (including ABCP), negotiable CDs, and short-term municipal debt (including VRDNs that met certain criteria).[14] Eligible MMFs were limited to domestic prime and tax-exempt MMFs. Table 1 presents a timeline for the evolution of the MMLF.

The MMLF lending rate was equal to the primary credit rate (PCR) offered by the Federal Reserve Bank of Boston at the time the loan was made plus a spread based on the collateral type. Specifically, the rate for loans secured by U.S. Treasury securities, fully guaranteed agencies, and GSE debt was equal to the PCR. Loans secured by municipal short-term debt, including VRDNs, were made at the PCR plus 25 basis points. The rates on all other MMLF loans were equal to the primary credit rate plus 100 basis points.[15] The maturity of each MMLF

Table 1
Evolution of the MMLF

Date	Eligible Funds	Eligible Collateral
March 18 (facility is announced)	Domestic prime MMFs	U.S. Treasuries and fully guaranteed agencies; securities issued by GSEs; certain ABCP; certain CP
March 20 (eligible funds and eligible collateral are expanded)	Domestic prime and tax-exempt MMFs	U.S. Treasuries and fully guaranteed agencies; securities issued by U.S. GSEs; certain ABCP; certain CP; certain U.S. municipal short-term debt
March 23 (facility opens; further expansion of eligible collateral is announced)	Domestic prime and tax-exempt MMFs	U.S. Treasuries and fully guaranteed agencies; securities issued by U.S. GSEs; certain ABCP; certain CP; certain U.S. municipal short-term debt; certain CDs; certain VRDNs

loan was equal to the remaining maturity of the collateral pledged under the facility, up to a maximum of twelve months. There was no haircut on the collateral.

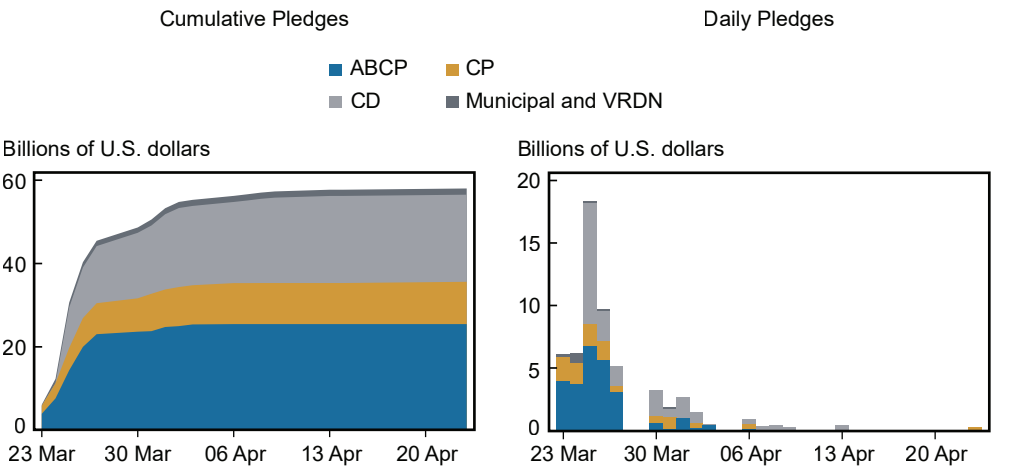
Importantly, the Federal Reserve, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation allowed banks to neutralize the effects of participating in the MMLF on their risk-based and leverage capital ratios by excluding the effects of buying assets through the MMLF from the calculation of regulatory capital requirements.[16] Moreover, on May 5, the same agencies collectively issued an interim final rule that neutralized the impact of the nonrecourse funding provided by the MMLF on the calculation of banks' liquidity coverage ratios.

3.2 Comparison with the AMLF

The core structure and design of the MMLF was based on the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF), which was established in response to the September 2008 run on MMFs. Accordingly, the AMLF and MMLF were very similar, both in terms of institutional set-up and intentions. First, as with the MMLF, the AMLF was created by the Federal Reserve under the authority of Section 13(3) of the Federal Reserve Act.[17] Second, the AMLF was administered by the Federal Reserve Bank of Boston, which made nonrecourse loans to eligible borrowers, taking as collateral eligible assets purchased by the borrowers from prime MMFs. Finally, each AMLF loan was also fully collateralized by the security purchased by the AMLF borrower: the collateral was purchased at amortized cost and had to be top-rated, with the maturity of the loan matching the remaining maturity of the collateral.[18]

There are, however, some important differences. First, as its name implies, eligible collateral under the AMLF was limited to certain ABCP, as the ABCP market was much larger in 2008 and had been under particularly severe stress during the global financial crisis. In contrast, the MMLF accepted a broader slate of collateral, as previously discussed. Second, given the improvements in financial conditions that followed the establishment of the AMLF, the Federal Reserve amended the AMLF in June 2009 to require that, in order to be eligible to participate,

Chart 4
MMLF Pledges by Asset Category



Sources: Federal Reserve Bank of Boston; staff calculations.

Notes: The left panel shows the cumulative value of the assets pledged to the MMLF in billions of U.S. dollars, by asset category; the right panel shows their daily value in billions of U.S. dollars.

MMFs must have experienced single-day or multiple-day net redemptions that exceeded set thresholds;[19] there was no such requirement under the MMLF.

The AMLF was announced on September 19, 2008, began operations on September 22, and was closed on February 1, 2010.

3.3 MMLF Usage

From its opening (March 23, 2020) to its last transaction (April 23, 2020), the MMLF extended loans to nine banks and bank holding companies, which purchased $58 billion of securities from MMFs (Chart 4, left panel).[20] For comparison, the value of the ABCP pledged to the AMLF in 2008 was much larger, at about $200 billion, but its usage relative to the industry's assets was only slightly higher than the MMLF's.[21] As had happened with the AMLF, all loans made under the MMLF were repaid in full, with interest, in accordance with the terms of the facility.

Of the securities pledged to the MMLF, 44 percent were ABCP, 36 percent CDs, 18 percent unsecured CP, and the rest VRDNs and municipal debt, consistent with funds using the MMLF mainly to sell their illiquid assets to meet redemptions and stem future ones. Daily sales were the highest ($18 billion) on March 25 (Chart 4, right panel), two days after it was announced that negotiable CDs and VRDNs were MMLF-eligible; 53 percent of the March 25 sales were indeed CDs.[22]

The facility was used by 47 domestic prime MMFs out of a total of 95. Table 2 shows average portfolio characteristics of domestic prime MMFs at the end of February 2020, separating funds that participated in the MMLF from those that did not.[23] Sixty-three percent

Table 2
Characteristics of Domestic Prime MMFs as of February 2020 for MMLF Participants and Nonparticipants

	Participated	Did Not Participate	Difference
TNA (billions of dollars)	10.3	18.0	-7.7
	(21.1)	(36.3)	(-1.0)
WAM (days)	31.7	28.3	3.3
	(8.8)	(6.6)	(1.4)
WLA (percent)	41.7	43.6	-2.0
	(5.2)	(7.4)	(-1.2)
ABCP (percent)	12.5	6.8	5.6*
	(9.7)	(10.9)	(2.0)
CD (percent)	25.9	21.4	4.5
	(13.8)	(14.8)	(1.1)
CP (percent)	35.4	43.9	-8.5*
	(14.2)	(23.2)	(1.8)
Treasury (percent)	1.3	3.5	-2.2*
	(2.3)	(7.3)	(-1.8)
Agency (percent)	1.4	3.5	-2.1
	(3.9)	(7.3)	(-1.5)
Repos (percent)	21.1	15.3	5.8*
	(10.3)	(11.3)	(2.0)
Flows (percent)	-19.1	2.6	-21.7***
	(19.3)	(12.6)	(-4.4)
Institutional (percent)	62.8	22.2	40.6***
			(3.1)

Sources: Federal Reserve Bank of Boston; iMoneyNet; Securities and Exchange Commission; staff calculations.

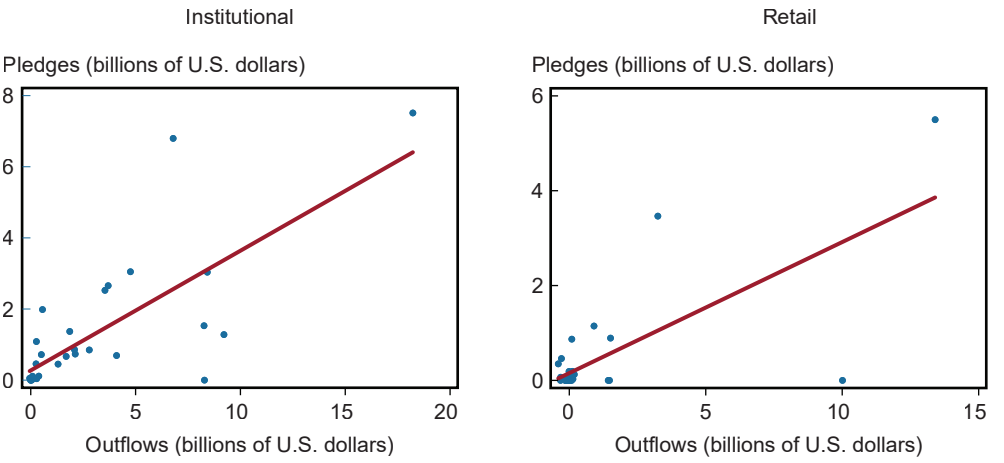
Notes: The first two columns show the mean and standard deviation (in parentheses) of funds' characteristics at the end of February 2020. The third column presents the difference in the means and the *t*-statistic for the null that the means are equal. TNA is the fund's total net assets. WAM is the weighted average maturity of the fund's portfolio. WLA is the percentage of weekly liquid assets in the fund's portfolio. ABCP, CD, CP, Treasury, agency, and repos are the percentage of the fund's portfolio invested in those asset types. Flows is the net flow between March 6 and March 20 (that is, from the start of the run until the last business day before the MMLF opened) relative to the fund's TNA at the end of February. Institutional is the percentage of MMFs that were institutional funds.

* $p < 0.10$

** $p < 0.05$

*** $p < 0.01$

Chart 5
Fund-Level MMLF Pledges vs MMF Outflows during the March 2020 Run (March 6-20)



Sources: Federal Reserve Bank of Boston; iMoneyNet; staff calculations.

Notes: The chart plots fund-level pledges to the MMLF against fund-level outflows in billions of U.S. dollars from March 6, the start of the run, through March 20, the last business day before the opening of the MMLF. Institutional funds are shown in the left panel; retail funds are shown in the right panel.

of participating funds were institutional funds. Funds that participated in the MMLF held more ABCP and repos and less Treasury securities and unsecured CP than funds that did not. The most important differences, however, are that funds that participated in the MMLF experienced significantly larger outflows during the run (a 22 percentage point difference from March 6 to March 20) and were more likely to be institutional funds.[24]

Funds that experienced larger outflows during the run and before the opening of the MMLF (March 6-20) were more likely to use the MMLF and pledged more assets to it (Chart 5). For both institutional and retail funds, there is a positive relationship between the outflows suffered during the run and the fund's usage of the MMLF. We estimate the magnitude of this relationship through regression analysis: a $1 billion dollar increase in outflows during the run (March 6-20) leads to an increase in MMLF asset pledges of $337 million for institutional funds and $275 million for retail funds; these effects are not only statistically significant but also economically important (see Box 1).

Through the MMLF, domestic prime funds boosted their liquidity positions by selling their more illiquid assets.[25] The WLA of institutional funds dropped in the week ahead of the introduction of the MMLF, when outflows were the highest and MMFs struggled to meet investors' redemptions with their liquid assets. Their WLA, however, bounced back after the MMLF began its operations and, starting from early April, institutional funds' WLA exceeded their February 2020 levels (Chart 6, left panel).[26] Although the WLA of retail funds did not drop materially during the run, likely because they suffered smaller redemption pressure, these funds also significantly increased their WLA positions after the introduction of the MMLF (Chart 6, right panel).[27]

Box 1

MMLF Usage as a Function of Funds' Outflows

We run the following fund-level cross-sectional regression:

$$MMLF\ Pledges_i = \alpha + \beta_0\, Inst_i + \beta_1\, Run\ Flows_i + \beta_2\, Inst_i * Run\ Flows_i + \epsilon_i,$$

where $MMLF\ Pledges_i$ is the pledge of fund i's assets to the MMLF in billions of dollars; $Inst_i$ is a dummy variable for institutional funds; and $Run\ Flows_i$ is fund i's cumulative net flows for the run period in billions of dollars. The regression is run on prime-MMF data from iMoneyNet. The model is estimated for three run periods: March 6-18, March 6-20, and March 6-26 (see table, columns 1-3). t statistics, in parentheses, are robust to heteroskedasticity.

	MMLF Pledges (Billions of Dollars)		
	(1)	(2)	(3)
Inst	0.057	0.107	0.047
	(0.35)	(0.66)	(0.28)
Run Flows (billions of dollars)	-0.410*	-0.275**	-0.188**
	(-1.98)	(-2.11)	(-2.08)
Inst*Run Flows (billions of dollars)	-0.055	-0.062	-0.140
	(-0.25)	(-0.42)	(-1.28)
Observations	61	61	61
Run period	3/6-3/18	3/6-3/20	3/6-3/26

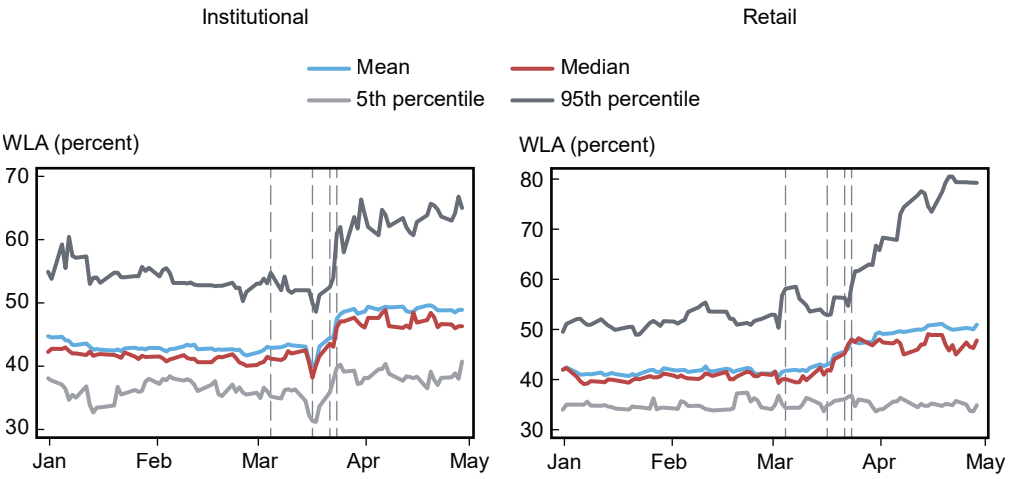
Sources: Federal Reserve Bank of Boston; iMoneyNet; staff calculations.

Note: Values in parentheses are *t* statistics.

* p < 0.10

** p < 0.05

Chart 6
Weekly Liquid Assets (WLA) of Prime MMFs, January-April 2020



Sources: iMoneyNet; staff calculations.

Notes: The chart shows the average and median shares of WLA, together with the 5th and 95th percentiles, in the portfolios of institutional (left panel) and retail (right panel) prime MMFs from January to April 2020. Data are in percent and at the daily frequency. Vertical lines show March 6 (beginning of the 2020 run), March 18 (MMLF announcement), March 23 (MMLF opening), and March 25 (when the MMLF started accepting CDs and VRDNs as collateral).

Table 3 shows the average remaining maturities, computed as of the end of February 2020, of the ABCP, CP, and CDs pledged to the MMLF and compares them with the average remaining maturities of the same security types held by prime MMFs at the end of February.[28] For all asset classes, the average maturity of the securities pledged is significantly greater than the average maturity of the securities held: the difference ranges from 16 (CDs) to 34 (CP) days. Li et al. (2020) obtains similar results in a regression setting. This evidence shows that prime funds boosted their liquidity by selling assets with longer maturities, which were more likely to be illiquid.[29]

3.4 Effect of the MMLF on Investor Flows

Outflows from prime MMFs began to abate shortly after the MMLF was announced on March 18. Between March 23 (the first day of MMLF operations) and the end of March, domestic prime MMFs suffered outflows of only $28 billion, more than half of which occurred over the first two days of MMLF operation, that is, before CDs and VRDNs could be pledged at the MMLF. At the beginning of April, domestic prime MMFs started to experience moderate inflows, and by the end of April, they received net inflows of $47 billion (33 percent of what they lost during the run). The rebound for offshore prime MMFs was similar: they suffered outflows until April 1, when their assets reached their minimum level for 2020, but from April 1 onward, they experienced net inflows for twelve consecutive days, for a total of $28 billion (28 percent of what they lost during the run).

One could wonder whether such a massive reduction in outflows was due to the MMLF or rather to changing market conditions. The task of identifying the impact of the MMLF is made

Table 3

Average Remaining Maturity of Securities Sold to the MMLF and of Those in the Portfolio of Prime MMFs at the End of February 2020

	ABCP			CP			CD		
	Held at end of February	Sold to MMLF	Difference	Held at end of February	Sold to MMLF	Difference	Held at end of February	Sold to MMLF	Difference
Remaining maturity at end-February (days)	74	93	19.3***	100	134	33.8***	117	133	15.6***
	(65)	(46)	(6.8)	(87)	(76)	(5.7)	(90)	(96)	(2.9)

Sources: Federal Reserve Bank of Boston; iMoneyNet; Securities and Exchange Commission; staff calculations.

Notes: The table shows the mean and standard deviation (in parentheses) of the remaining maturities of the ABCP, CP, and CDs held in MMF portfolios at the end of February 2020 and of the ABCP, CP, and CDs pledged by MMFs to the MMLF. The third column for each security type shows the difference between the means and the *t*-statistics for the null that the means are equal. Remaining maturities are calculated in days relative to February 28.

more difficult by the fact that other Federal Reserve facilities, such as the Commercial Paper Funding Facility and the Primary Dealer Credit Facility, were established at the same time.[30]

To identify the effect of the MMLF on fund flows and measure its effectiveness in stemming the run, we follow a methodology similar to that developed by Duygan-Bump et al. (2013) to estimate the impact of the AMLF. The authors proposed to identify the impact of the AMLF on outflows by assuming that it should be stronger for funds that have relatively more ABCP to sell to the AMLF.[31]

Similarly, through regression analysis, we estimate the impact of the MMLF by assuming that it should be stronger on those funds that hold relatively more illiquid assets in their portfolios (which therefore benefit more from the MMLF's liquidity provision) and whose investors are more concerned about the funds' liquidity (see Box 2). For domestic institutional prime MMFs, a 10 percentage point increase in the share of illiquid securities in the fund's portfolio leads to an increase in daily flows of 0.4 percentage point after the introduction of the MMLF. This effect is not only statistically significant but also economically important: over the twenty business days (that is, roughly a month) following the opening of the facility, it amounts to an increase in cumulative flows of 8 percentage points.

For retail funds, in contrast, the share of illiquid securities in the fund portfolio does not have a material effect on the fund's post-MMLF flows, a result consistent with the fact that retail outflows during the run were unrelated to funds' liquidity positions; as discussed above, retail fund outflows were driven by other factors, including, in particular, a contagion spillover from the outflows in the institutional prime funds in the same family (Cipriani and La Spada 2020). The results are also insignificant for offshore prime MMFs, which is consistent with the fact that offshore funds were not eligible to participate in the MMLF. This evidence, however, should not be read as implying that the MMLF did not have an impact on retail or offshore funds; indeed, as mentioned above, outflows from those funds also abated after the inception of the facility. Arguably, the reduction in retail and offshore outflows was not a direct result of the funds' use of the facility; rather, it was likely due to the overall improvement in secondary market conditions and the reduction in contagion spillovers from institutional funds.

3.5 Effect of the MMLF on Secondary-Market Rates

Money market rates declined after the introduction of the MMLF (Chart 3). The spreads between rates for top-rated CP (both secured and unsecured) and the IOER went back to their pre-crisis levels by April 1, that is, roughly within a week after the MMLF began operations. The reduction in second-tier nonfinancial CP was also visible but more gradual: at the end of April 2020, its spread relative to the IOER was still around 0.5 percent, up from 0.1 percent at the end of February.

As with flows, it is difficult to attribute the improvement in market rates to the MMLF because market conditions were changing dramatically over the run period. To identify the effect of the MMLF on money market rates, we exploit the fact that second-tier CP is not eligible collateral under the MMLF. Therefore, we expect that, if the MMLF had an impact, rates on second-tier CP should revert more slowly than other CP rates across maturity buckets. Regression analysis shows that, in the month following the introduction of the MMLF, the rates of second-tier CP declined less than those of top-rated ones by 0.9 percentage point; this result holds across all maturity buckets considered, from overnight to thirty days (see Box 3).

Box 2

Effect of the MMLF on the Flows in Prime MMFs

We run the following fund-level panel regression at a daily frequency on January-April 2020:

$$Flows_{it} = \alpha_i + \mu_t + \beta MMLF_t \times Illiquid\,Securities_i + \epsilon_{it},$$

where $Flows_{it}$ is the net flow in fund i on day t as a percentage of its total net assets (TNA) on the previous business day; $MMLF_t$ is a dummy equal to one after the MMLF became operational (March 23); and $Illiquid\ Securities_i$ is the share of illiquid securities in the portfolio of fund i. $Illiquid\ Securities_i$ includes ABCP, unsecured CP, CDs, and VRDNs; we measure the share of illiquid securities in a fund's portfolio in December 2019 to mitigate endogeneity issues. We include fund fixed effects (α_i) to control for unobservable fund-specific characteristics, and time fixed effects (μ_t) to control for unobservable macro factors. Standard errors are robust to heteroskedasticity and to both a serial and cross correlation (Driscoll-Kraay standard errors with ten lags). The regression is run on prime-MMF data from iMoneyNet.

The model is estimated separately on domestic institutional, domestic retail, and offshore prime funds (see table, columns 1-3).

	Flows (Percent)		
	(1)	(2)	(3)
MMLF * Illiquid Securities (percent)	0.043***	-0.006	-0.001
	(2.72)	(-1.17)	(-0.17)
Observations	2,573	2,560	2,295
Sample	Institutional	Retail	Offshore
Date fixed effects	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes

Sources: iMoneyNet; staff calculations.

Note: Values in parentheses are *t* statistics.

*** p < 0.01

For robustness, we also estimated the regression changing the definition of the MMLF dummy to when the facility was announced (March 18) and to when it started accepting CDs and VRDNs (March 25); results (not shown) are largely similar.

Box 3

Effect of the MMLF on CP Rates

We run the following regression on a panel of daily rates for various CP types and maturity buckets:

$$Rate_{it} = \alpha_i + \mu_t + \beta MMLF_t \times Second\ Tier_i + \epsilon_{it},$$

where $Rate_{it}$ is the spread between the rate of CP of type i and the IOER on day $MMLF_t$ is defined as in Box 2; and $SecondTier_i$ is a dummy for second-tier CP, which were not eligible for the MMLF. The types of CP included are AA ABCP, AA financial unsecured CP, AA nonfinancial unsecured CP, and second-tier nonfinancial CP. We include security-type fixed effects (α_i) to control for unobservable security-type characteristics, and time fixed effects (μ_t) to control for macro factors. Data on CP rates are from the Federal Reserve Board. The model is estimated on January–April 2020, and standard errors are Driscoll-Kraay with ten lags.

The model is estimated separately on overnight, seven-day, and thirty-day maturities (see table, columns 1-3).

Since the slower normalization of second-tier CP rates after the introduction of the MMLF could be at least partially driven by their higher credit risk—rather than their ineligibility under the MMLF—for robustness, we estimate the regression also including as regressor the interaction of the VIX index, which captures changes in market volatility, with the dummy for second-tier CP; although the results are smaller in magnitude, they are qualitatively similar (see table, columns 4-6).

Rate (Percent)

	(1)	(2)	(3)	(4)	(5)	(6)
MMLF*Second Tier	0.894***	0.873***	0.952***	0.315	0.417**	0.587***
	(2.71)	(3.55)	(6.42)	(1.26)	(2.29)	(4.13)
VIX*Second Tier				0.031***	0.024***	0.019***
				(4.53)	(4.74)	(4.69)
Observations	332	314	289	332	314	289
Maturity	Overnight	7 day	30 day	Overnight	7 day	30 day
Security-type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Date fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Sources: Federal Reserve Bank of St. Louis, FRED database; Federal Reserve Board (CP rates); staff calculations.

Note: Values in parentheses are *t* statistics.

** p < 0.05

*** p < 0.01

Box 4

Effect of the MMLF on CD Rates

The table below reports the estimates of the regressions described in Box 3 run on CD rates (instead of CP rates, which could also be affected by the CPFF); data are from Form FR2420. To identify the impact of the MMLF on CD rates, we interact the MMLF dummy with a dummy for nonnegotiable CDs, which, like second-tier CP, were not eligible for the MMLF. We estimate the model separately for deposits with remaining maturities within seven days and fifteen to thirty days (see table, columns 1 and 2). Standard errors are Driscoll-Kraay with ten lags. The sample period is January–April 2020.

As with CP, we also estimate the regression on CD rates including as regressor the interaction of the VIX with the dummy for nonnegotiable deposits, to control for the effect of a possible difference in credit risk. The results (see table, columns 3 and 4) are similar to the baseline results.

	Rate (Percent)			
	(1)	(2)	(3)	(4)
MMLF*Nonnegotiable	0.176***	0.098***	0.171***	0.127***
	(5.97)	(3.28)	(5.55)	(3.03)
VIX*Nonnegotiable			0.000	-0.001
			(1.02)	(-1.15)
Observations	164	160	162	158
Maturity	Within 7 days	15-30 days	Within 7 days	15-30 days
Security-type fixed effects	Yes	Yes	Yes	Yes
Date fixed effects	Yes	Yes	Yes	Yes

Sources: FR2420, *Report of Selected Money Market Rates*; staff calculations.

Note: Values in parentheses are *t* statistics.

*** $p < 0.01$

Roughly at the same time as the MMLF, the Federal Reserve also established the Commercial Paper Funding Facility (CPFF) to provide liquidity to CP issuers. The CPFF supported only primary issuance, not the secondary market; nevertheless, since the CPFF also did not accept second-tier CP, the above results could be driven by the impact of the Federal Reserve's support of CP issuance on secondary markets. To address this concern, we repeat a similar regression analysis for CDs, whose issuance was not supported by the CPFF. To identify the effect of the MMLF on CD rates, we exploit the fact that only negotiable CDs could be pledged to the facility. Results are similar to those for CP: after the introduction of the MMLF, the rates of nonnegotiable deposits maturing within seven days decline by 0.2 percentage point less than those of negotiable CDs with the same maturity. The result is weaker for CDs with maturities of fifteen to thirty days but still statistically significant (see Box 4).

4. Conclusion

In March 2020, as the COVID-19 pandemic was hitting the United States and Europe, prime MMFs suffered very large investor outflows, similar in percentage terms to those experienced in 2008 during the global financial crisis. The Federal Reserve established the MMLF to assist "money market funds in meeting demands for redemptions by households and other investors, enhancing overall market functioning and credit provision to the broader economy."[32]

Through the MMLF, the Federal Reserve Bank of Boston made nonrecourse loans to eligible borrowers, taking as collateral eligible assets purchased by the borrowers from eligible MMFs. The facility, which was similar to the AMLF established in 2008, absorbed $58 billion of prime and tax-exempt MMF assets. With the facility's assistance, MMFs sold their most illiquid securities, thereby boosting their liquidity positions while meeting redemptions. In the aftermath of the MMLF's inception, outflows from prime funds abated, and the strains in the broader short-term funding markets subsided.

Because the MMLF was established in the midst of a financial crisis and a rapidly changing economic outlook, it is difficult to directly estimate its impact. Nonetheless, we provide evidence that the facility directly helped stem outflows from prime MMFs and contributed to the easing in money market rates. Because of its positive effect on secondary markets, the facility also had a beneficial impact on offshore prime MMFs, which it did not directly target. By helping prime MMFs meet redemptions and reduce their outflows, the facility improved overall market functioning and supported credit provision to the real economy.

Notes

Acknowledgments: The authors thank Catherine Huang, Abduel Hussein, and Reed Orchinik for excellent research assistance. They also thank Jie Chen, Christine Docherty, Lei Li, Marco Macchiavelli, Patrick McCabe, and an anonymous referee for useful comments.

[1] Domestic MMFs are registered with the Securities and Exchange Commission (SEC) and are governed by its Rule 2a-7. Offshore MMFs are dollar-denominated, domiciled in the member states of the European Union (EU), and governed by EU rules.

[2] Tax-exempt MMFs mainly invest in debt issued by state and local governments. They represent a very small fraction of the industry and are not the focus of this article. All of our analyses, with the exception of the statistics on MMLF usage, focus on prime funds only.

[3] As explained above and in Section 3.1, through the MMLF, the Federal Reserve Bank of Boston made loans available to eligible banks secured by assets purchased from MMFs. Therefore, MMFs did not directly "use" or "participate" in the facility. Nevertheless, throughout this article, we will employ those terms to reflect the fact that the MMLF was set up to "assist money market funds in meeting demands for redemptions by households and other investors, enhancing overall market functioning and credit provision to the broader economy" (Federal Reserve Board press release, March 18, 2020, https://www.federalreserve.gov/newsevents/pressreleases/monetary20200318a.htm).

[4] The remaining 3 percent was held by tax-exempt funds (see endnote 2).

[5] The SEC adopted an initial, more limited, set of regulatory changes of the MMF industry in 2010.

[6] Weekly liquid assets include cash, U.S. Treasury securities, certain other government securities that mature within sixty days, and securities that mature or are puttable within five business days. For more details, see https://www.sec.gov/news/press-release/2014-143.

[7] In the EU, offshore government MMFs are referred to as "public debt" funds; offshore prime MMFs are divided in three subgroups: low-volatility NAV funds (the largest group), short-term variable (that is, floating) NAV funds, and standard variable NAV funds.

[8] See https://www.immfa.org/market-statistics/immfa-aum.html

[9] For more details, see https://eur-lex.europa.eu/eli/reg/2017/1131/oj.

[10] Our daily data on MMF flows are from iMoneyNet, which, at the end of 2019, covered 82 percent of the industry.

[11] The Reserve Primary Fund was a large prime MMF that suspended redemptions and faced a lengthy liquidation due to losses on its holdings of Lehman Brothers debt. "Breaking the buck" means that a stable-NAV fund reprices its shares at an NAV that reflects the market-based value of its portfolio; this can happen if the market value of its portfolio drops below $0.995 per share.

[12] Concerns that fees and gates might trigger preemptive runs were raised at the time the SEC proposed the new regulation (see Rosengren 2013 and Cipriani et al. 2014).

[13] See https://www.federalreserve.gov/newsevents/pressreleases/monetary20200318a.htm.

[14] Eligible collateral was valued at either amortized cost or fair value, depending on the collateral type. CP, ABCP, CDs, and U.S. municipal short-term debt, including VRDNs, were valued at amortized cost. For more information on eligible borrowers, eligible assets, and eligible lenders, see the MMLF term sheet at https://www.federalreserve.gov/monetarypolicy/mmlf.htm.

[15] In extending emergency credit, the Federal Reserve Board's practice is to set the interest rate at a penalty rate that is designed to encourage borrowers to repay the loans quickly. See https://www.federalreserve.gov/newsevents/pressreleases/bcreg20151130a.htm.

[16] See https://www.federalregister.gov/documents/2020/03/23/2020-06156/regulatory-capital-rule-money-market-mutual-fund-liquidity-facility.

Notes (Continued)

[17] In 2010, the Dodd-Frank Act modified Section 13(3) of the Federal Reserve Act. Among other things, the amendments mandated that any emergency lending facilities authorized by the Federal Reserve under Section 13(3) must be approved by the Secretary of the Treasury. See https://www.federalreserve.gov/monetarypolicy/bsd-appendex_201508.htm.

[18] One difference relative to the MMLF is that the maturity of an AMLF loan (and the remaining term of the collateral) was capped at 120 days for depository institutions and 270 days for nondepository institutions. A second difference is that the rate on an AMLF loan was equal to the PCR offered by the Federal Reserve Bank of Boston at the time the loan was made, without any premium.

[19] Specifically, the fund must have experienced either: (1) a single-day net redemption that exceeded at least 5 percent of the fund's net assets on any given day during the five business days preceding AMLF usage, or (2) multiple-day net redemptions over the course of five or fewer business days that exceeded at least 10 percent of the fund's net assets.

[20] The statistics on usage in Chart 4 include assets pledged by both prime and tax-exempt funds.

[21] The facility usage relative to total assets was about 10 percent under the AMLF and slightly below 8 percent under the MMLF (Anadu and Sanders 2021). In dollar terms, MMLF pledges in 2020 were significantly smaller than AMLF pledges in 2008 because the size of the prime-MMF industry shrank by more than $1 trillion from November 2015 to October 2016 in response to the 2014 SEC reform (Cipriani and La Spada 2021).

[22] Although their eligibility was announced on March 23, CDs and VRDNs could not be pledged at the MMLF until March 25 or later.

[23] From this point on, we merge the data on the MMLF with iMoneyNet data on MMFs. Sixty-seven transactions (out of 1,507), accounting for $4.4 billion of MMLF loans (7.5 percent of the total), are with four funds that are not listed in iMoneyNet and are dropped from the empirical analysis.

[24] Participating funds also had slightly lower WLA, but the difference is not statistically significant because retail funds, which suffered smaller outflows and had fewer incentives to use the facility, tend to have lower WLA (see Chart 6).

[25] In addition to improving funds' liquidity position through this direct channel, the MMLF also did so through an indirect channel: as the MMLF slowed the run on the industry, funds had the time needed to let their less-liquid assets mature so that they could then use the proceeds to buy more-liquid assets.

[26] The average WLA of institutional prime MMFs went from 42 percent at the end of February to 49 percent at the end of April. The fund on the 95th percentile of the WLA distribution increased its WLA even more, from 52 percent to 65 percent.

[27] The average WLA of retail funds went from 41 percent at the end of February to 51 percent by the end of April, and the fund at the 95th percentile of the distribution boosted its WLA by more than 20 percentage points, from 52 percent to 79 percent.

[28] To calculate the remaining maturity of the securities held by prime MMFs at the end of February 2020, we use security-level data from SEC's Form N-MFP.

[29] Illiquid assets such as CDs and CP enter the calculation of a fund's WLA only when their remaining maturity is five days or less.

[30] A description of the Federal Reserve's policy tools, including the 2020 liquidity and credit facilities, can be found at https://www.federalreserve.gov/monetarypolicy/policytools.htm.

[31] Li et al. (2020) also find evidence that the MMLF slowed the run by comparing the post-MMLF flows of domestic MMFs, which were eligible to use the MMLF, with those of offshore funds, which were not.

[32] March 18, 2020, Federal Reserve Board press release.

References

Anadu, K., and S. Sanders. 2021. "Money Market Mutual Funds: Runs, Emergency Liquidity Facilities, and Potential Reforms." Federal Reserve Bank of Boston Supervisory Research and Analysis Notes 21, no. 3 (May). https://www.bostonfed.org/publications/supervisory-research-and-analysis-notes/2021/money-market-mutual-funds-runs-emergency-liquidity-facilities-and-potential-reforms.aspx.

Cipriani, M., and G. La Spada. 2020. "Sophisticated and Unsophisticated Runs." Federal Reserve Bank of New York Staff Reports, no. 956, December.

Cipriani, M., and G. La Spada. 2021. "Investors' Appetite for Money-Like Assets: The MMF Industry after the 2014 Regulatory Reform." Journal of Financial Economics 140, no. 1 (April): 250-69.

Cipriani, M., A. Martin, P. McCabe, and B.M. Parigi. 2014. "Gates, Fees, and Preemptive Runs." Federal Reserve Bank of New York Staff Reports, no. 670, April.

Duygan-Bump, B., P. Parkinson, E. Rosengren, G. Suarez, and P. Willen. 2013. "How Effective Were the Federal Reserve Emergency Liquidity Facilities? Evidence from the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility." Journal of Finance 68, no. 2 (April): 715-37.

Li, L., Y. Li, M. Macchiavelli, and X. Zhou. 2021. "Liquidity Restrictions, Runs, and Central Bank Interventions: Evidence from Money Market Funds." Review of Financial Studies 34, no. 11 (November): 5402-37.

Rosengren, E. 2013. "Re: Securities and Exchange Commission's Money Market Fund Reform; Amendments to Form PF (the "Proposal"), SEC File No. S7-03-13, 78 FR 36833, June 5, 2013." Comment letter to the Securities and Exchange Commission on behalf of Federal Reserve Bank presidents, September 12. https://www.sec.gov/comments/s7-03-13/s70313-111.pdf.

FEDERAL RESERVE BANK OF NEW YORK
ECONOMIC POLICY REVIEW

Series Editor: Julian di Giovanni. *Editorial Staff*: Robert Powell, Trevor Delaney, Maureen Egan, Anna Snider, and Peter Stevens. *Design Staff*: Theresa Izzillo, Alyona Botogoeva, and Laura Gharrity.

www.newyorkfed.org/research
Follow us on Twitter: *@NYFedResearch*