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The Federal Reserve Municipal Liquidity Facility (MLF): Where the municipal securities market and fed finally meet

Craig L. Johnson¹ | Tima T. Moldogaziev² | Martin J. Luby³ | Ruth Winecoff¹

¹O'Neill School of Public and Environmental Affairs, Indiana University, Bloomington, Indiana, USA

²School of Public Policy, The Pennsylvania State University, University Park, Pennsylvania, USA

³Lyndon B. Johnson School of Public Affairs, The University of Texas at Austin, Austin, Texas, USA

Correspondence

Tima T. Moldogaziev, School of Public Policy, The Pennsylvania State University, University Park, 324 Pond Laboratory, PA 16802, USA. Email: timatm@psu.edu

Abstract

The CARES Act authorized the Municipal Liquidity Facility (MLF) with an explicit purpose of aiding state and local governments with their liquidity needs during the COVID-19 pandemic. Unlike other federal liquidity facilities authorized by the Act that offered short-term financing to certain dealers and institutional investors in municipal securities, the MLF offered direct access to liquidity to eligible state and local governments. In this article we describe the MLF, including its legal arrangements, structural characteristics, and public policy features. We then empirically evaluate the pricing, credit rating, and issuer eligibility requirements of the MLF, in the context of other federal interventions, using difference-in-differences and interrupted time series analysis techniques. Finally, we propose suggestions for the evolution of the MLF and the Federal Reserve's liquidity provision role in response to continued exposure to and recovery from the COVID-19 pandemic.

Applications For Practice

- The Municipal Liquidity Facility (MLF) provides an example that the Federal Reserve can quickly and successfully create a direct lending instrument to state and local governments in its role as "market maker of last resort" to help support the liquidity needs of these governments.
- Modifications to the direct lending terms of future MLFlike instruments, including lower credit spreads and availability to a greater and more diverse group of eligible borrowers, could increase its use by state and local governments.

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- To mitigate potential moral hazard problems, future MLF-like interventions may be structured to target benefits to not serve as a de facto federal bailout to poorly financially managed governments.
- Federal Reserve interventions supporting municipal market buy side, in addition to sell side activities (like the MLF), may be a multifaceted and efficacious approach to municipal market stabilizing.

INTRODUCTION

The Coronavirus Aid, Relief, and Economic Security Act (CARES Act) passed the U.S. Senate and U.S. House of Representatives on March 25, 2020 and was signed into federal law by the President on March 27, 2020. The CARES Act was intended to provide a public health and broader economic emergency assistance response to the coronavirus pandemic. The quick passage of the Act provides an indication of the seriousness of the health-care crisis facing the nation, its economic impact on American households and firms, and the potentially profound financial problems that state and local governments were likely to be exposed to for months to come.

When state and local governments began to shut down in mid-March 2020 during the first wave of COVID-19, the liquidity markets became adversely affected by investor flight (Wei & Yue, 2020). This caused short-term interest rates to rise dramatically in the municipal market as well, making it difficult and/or very expensive for state and local governments to borrow for near-term cash flow purposes. The CARES Act authorized the Federal Reserve to create the Municipal Liquidity Facility (MLF) for the purpose of aiding state and local governments with their increased liquidity needs because of the COVID-19 pandemic.¹ The MLF was created to provide liquidity in the event that state and local governments could not find cost-efficient short-term financing in capital markets. This quick and definitive action by the U.S. Congress should be viewed in contrast to the lack of any direct liquidity support to state and local governments during the financial crisis and Great Recession of 2007 to 2009.²

Prior to the authorization of the MLF on April 9, 2020, in mid-March 2020 the Federal Reserve extended access to private and corporate sector firms to four emergency lending facilities, which were initially created in response to the emerging liquidity crisis in the country. As described in Table 1, the Primary Dealer Credit Facility (PDCF) was designed to support primary dealer financial institutions by providing collateralized loan funding to primary dealers. The Money Market Mutual Fund Liquidity Facility (MMMF) was established to provide liquidity to money market mutual funds to meet the redemption demands of investors. The Commercial Paper Funding Facility (CPFF) was established to provide a liquidity backstop to commercial paper issuers. Finally, the Federal Reserve established the Term Asset-Backed Securities Loan Facility (TALF), which was intended to support the provision of credit to consumers and businesses by enabling the issuance of asset-backed securities loans.

All of the facilities authorized in March, except the TALF, began offering support to municipal securities dealers and holders around the same time, in addition to providing support more

¹Board of Governors of the Federal Reserve System, Municipal Liquidity Facility Term Sheet. Last accessed on September 29, 2020 at https://www.federalreserve.gov/monetarypolicy/muni.htm.

²It should be noted that there was an even greater spike in short term municipal interest rates in 2008. From the week of September 10, 2008 to September 17, 2008, the SIMFA index (Securities Industry and Financial Markets Association Municipal Swap Index) increased from 1.79% to 5.15%, and then increased to a high of 7.96% the following week (September 24, 2008). In contrast, in 2020 the SIFMA spiked only in March for 1 week, from 1.28% in the week of March 11, 2020 to 5.2% the week of March 18, 2020, and the SIFMA rate decreased steadily for the rest of March through April 28. The SIFMA index is a 7-day index consisting of tax-exempt variable rate demand obligations (VRDO).

Date:	20-Mar	23-Mar	23-Mar	23-Mar	9-Apr
Announced Date:	17-Mar	18-Mar	17-Mar	23-Mar	8-Apr
Liquidity Facility Details	Primary Dealer Credit Facility (PDCF)	Money Market Mutual Fund Liquidity Facility (MMLF)	Commercial Paper Funding Facility (CPFF)	Primary Market Corporate Credit Facility and Secondary Market Corporate Credit Facility (PMCCF) and (SMCCF)	Municipal Liquidity Facility (MLF)
	Allows primary dealers to pledge municipal bonds as collaterals to obtain loans with maturity up to 90 days.	Extended asset eligibility to include certain short-term municipal securities.	Extended asset eligibility to include certain short-term municipal securities.	Provides liquidity for outstanding corporate bonds, municipals not included.	An Eligible Issuer is a State, City, or County (or, subject to Federal Reserve review and approval, an entity that issues securities on behalf of the State, City, or County for the purpose of managing its cash flows), or a Multi-State Entity or Designated RBI.

TABLE 1 The activation of several liquidity facilities by the fed: March-April 2020

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broadly across financial markets. The PDCF extended loan funding to primary dealers that buy and sell municipal securities. The MMMF provided funding for municipal securities money market mutual funds to help meet the growing redemption demands of investors. The CPFF was allowed to purchase municipal commercial paper to support certain types of municipal shortterm funding needs. While the CPFF was never used, it was authorized to lend up to \$10 billion, which sent a strong signal to the market affirming the Federal Reserve's commitment to provide liquidity support to the commercial paper market. As of December 31, 2020, the PDCF provided \$485 million and the MMMF over \$3.65 billion in funding (Board of Governors of the Federal Reserve System, 2021).

In early April 2020, the Federal Reserve authorized several new emergency lending facilities, which were passed in the CARES Act and designed to support corporate credit, main street lending, employee paycheck protection, and lending to state and local governments (i.e., the MLF).³ In this article, we analyze the MLF to understand the implications of its legal and financial structure as a federal policy tool designed for state and local governments and their securities market. We describe the legal arrangements, structural characteristics, and public policy features of the MLF. We evaluate the MLF in terms of its ability to support the maintenance of liquidity in the municipal securities market during the COVID-19 pandemic.

Furthermore, we analyze the MLF in the context of other liquidity facilities that were activated in March before the MLF was established by the Fed. In particular, our paper builds on recent work assessing the impact of the Fed's liquidity facilities on the corporate and municipal securities dealers and institutional investors (Gilchrist et al., 2020; Li et al., 2020; O'Hara & Zhou, 2020). Specifically, Li et al. (2020) find that the additional liquidity provided by the Federal Reserve helped increase liquidity in the municipal secondary market by stemming outflows from mutual funds. O'Hara and Zhou (2020) find that the SMCCF and PDCF stabilized trading in the corporate market by providing a liquidity backstop and improving dealer funding conditions. Gilchrist et al. (2020) find that SMCCF stabilized the corporate bond market and made it easier for companies to borrow. Given that these major liquidity facilities had significant effects on key buy-side municipal securities market actors, in analyzing the potential effect of the MLF, we must also address the question of what impact, if any, the earlier liquidity facilities had on the municipal securities market.

The focus of this article is on two aspects of the municipal securities market and MLF. First, this analysis is on the primary market activity and the short-term rates in the municipal securities market before and after the key liquidity facility interventions in March and the MLF in April. Here, we focus on the activation of both the MLF and other Federal Reserve liquidity facilities. To identify the explicit impact of the MLF, empirically speaking, we must account for the concurrent roles of several other federal liquidity interventions. In the context of the Fed's liquidity facilities, we evaluate securities' yields and market rates for periods before and after the interventions. However, unlike other recent studies on liquidity facilities, our primary focus is from the perspective of state and local governments and their demand for loanable funds that flow through the municipal securities market.

As to the second aspect, we investigate the level of participation in the MLF by state and local borrowers. We focus on the terms and structure of the MLF throughout the study, especially in terms of the size of the fund, pricing, credit ratings, and other eligibility requirements. As of this writing, the MLF is closed. We also note that only two borrowers participated in the

³The Fed established two corporate credit facilities (CCF): the Primary Market Corporate Credit Facility (PMCCF) and the Secondary Market Corporate Credit Facility (SMCCF). The PMCCF was authorized to purchase new issue corporate bonds and loans. The SMCCF was authorized to support liquidity for outstanding corporate bonds. The PMCCF did not make any loans, while the SMCCF provided over \$14 billion in loans. The CCF's authorization to purchase new assets expired as of December 31, 2020. The Paycheck Protection Program Loan Facility (PPPLF) served as a liquidity backstop for loans issued by banks to small businesses through the Paycheck Protection Program. In April, the Fed also established the Main Street Lending Program, which consists of five lending programs, two of which are for loans to nonprofit organizations.

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liquidity facility. Unlike several critics and proponents of the MLF, we do not, a priori, view the fact that only two borrowers participated in the liquidity facility designed specifically for state and local governments as a sign of failure or success.

The article proceeds as follows. The next section describes the MLF in detail. It covers the structure of the MLF, as well as the broader context of the Federal Reserve's several responses to the COVID-19 pandemic, and briefly lays out some of the controversies involved in federal intervention with municipal liquidity provision. Then, we analyze short-term debt municipal market yields and credit spreads over several time periods and across different types of short-term securities, including variable rate demand obligations (VRDOs). Throughout the study, we evaluate participation in the MLF by describing the size of the fund relative to potential issuance, issuer eligibility and credit rating requirements, and interest rates and credit spreads. The final section is a conclusion with implications for public policy practice and research.

THE MLF

Title IV of the CARES Act is the Economic Stabilization and Assistance to Severely Distressed Sectors of the Economy, which includes Subtitle A, the Coronavirus Economic Stabilization Act of 2020. Subtitle A contains legal authorization and broad guidelines for the establishment of the MLF. Subtitle A both describes and proscribes the authority of the Secretary of the Treasury in promoting emergency assistance to distressed sectors of the economy. Subtitle A is intended to provide "liquidity to eligible businesses, states, and municipalities related to losses incurred as a result of coronavirus."⁴ The liquidity emergency relief is authorized to be provided in the form of "loans, loan guarantees, and other investments" for a total amount not to exceed \$500 billion.⁵

The MLF was administered by the Board of Governors of the Federal Reserve in consultation with the Secretary of the Treasury under section 13(3) of the Federal Reserve Act of 1933. The Federal Reserve established a special purpose vehicle (SPV) to make short-term loans to state and local governments. All legal arrangements establishing, governing, and funding the SPV constitute the MLF. The SPV received an initial equity investment of \$35 billion and was authorized to purchase short-term securities from eligible issuers. However, the MLF's purchasing mandate ended on December 31, 2020.⁶

The MLF was intended to provide a liquidity backstop to issuers in the municipal securities market. Some of the most important features of the MLF for municipal issuers were those regarding eligible issuer requirements, pricing schedules, and credit ratings spread rules. Not all municipal issuers were eligible for MLF support. Broad eligible issuer categories are shown in Table 2, which also describes the evolution of the MLF.⁷ The list of eligible issuers began in April with all states and counties with a population above two million and cities with a population above one million.⁸ The list of eligible issuers was expanded substantially as of August 11, 2020, but smaller municipal issuers and special purpose governments—the vast majority of municipal governments—were never eligible for the MLF.

The MLF guidance also specified the credit rating requirements for municipal issuers to participate in the liquidity fund. This technically reduced the number of eligible issuers even

state and local governments up to \$500 billion maximum.

⁴See pg. 512 of H.R. 748, the Coronavirus Aid, Relief, and Economic Security Act (CARES Act).

⁵The \$500 billion cap included funding for eligible businesses. Not more than \$454 billion was initially made available to the states (plus the District of Columbia), counties, cities, and other designated entities. Other funds not used by passenger air carriers and businesses could also have been made available to

⁶It should be noted that the Treasury Department had the authority to extend the MLF without going back to Congress.

⁷Please note in Table 2 that emboldened entries indicate a change in the MLF provisions.

⁸Board of Governors of the Federal Reserve System. Report to Congress Pursuant to Section 13(3) of the Federal Reserve Act: Municipal Liquidity Facility. April 16, 2020. Effective April 9, 2020.

TABLE 2 The evol	ution of the municipal li	iquidity facility: March tl	hrough August 2020		
Date:	9-Apr	April 27	May 11	June 3	August 11
Total funding cap:	\$500b	\$500b	\$500b	\$500b	\$500b
Eligible issuers:	All states	All states	All states	All states	All states
	Counties, population >2,000,000	Counties, population >500,000	Counties, population > 500,000	At least two counties now eligible in each state	At least two counties now eligible in each state
	Cities, population >1,000,000	Cities, population >250,000	Cities, population >250,000	At least two cities now eligible in each state	At least two cities now eligible in each state
			Multi-state entities	Multi-state entities	Multi-state entities
				Designated Revenue Bond Issuer. Up to two per state. One in District of Columbia	Designated Revenue Bond Issuer. Up to two per state. One in District of Columbia
				Governors can desiginate two government-related agencies such as public transit agencies and utility companies	Governors can desiginate two government-related agencies such as public transit agencies and utility companies
Required credit rating:	Investment grade	Investment grade	Investment grade	Investment grade	Investment grade
Eligible securities:	Maturity ≤ 36 months	Maturity ≤ 36 months	Maturity ≤ 36 months	Maturity ≤ 36 months	Maturity ≤ 36 months
Termination date:	December 31, 2020	December 31, 2020	December 31, 2020	December 31, 2020	December 31, 2020
Base interest rate:	Overnight index swap	Overnight index swap	Overnight index swap	Overnight index swap	Overnight index swap
Credit spreads (bps):					
AAA/Aaa	150	150	150	150	100
AA+/Aa1	170	170	170	170	120
AA/Aa2	175	175	175	175	125

140	190	200	215	275	290	330	540
190	240	250	265	325	340	380	590
190	240	250	265	325	340	380	590
190	240	250	265	325	340	380	590
190	240	250	265	325	340	380	it 590
AA-/Aa3	A+/A1	A/A2	A-/A3	BBB+/Baa1	BBB/Baa2	BBB-/Baa3	Below investmen grade

Rating categories	State	County	City	All eligible governments
Aaa or AAA	17	56	29	102
Aa1/Aa2/Aa3 or AA+/AA/AA-	32	56	42	130
A1/A2/A3 or A+/A/A-	1	4	13	18
Baa1/Baa2/Baa3 or BBB+/BBB/BBB-	1	2	2	5
NR	-	1	-	1
Total ratings	51	119	86	256

Source: State credit ratings are from *The Bond Buyer*. County and city credit ratings, if rated, are from Fitch, Kroll, Moody's, and Standard & Poor's, respectively. All credit ratings are as of April 2020. When split ratings are observed, the higher credit rating is reported (there are 42 split ratings observed for cities, 37 for counties, and 23 for states). Exactly 246 eligible governments satisfy the minimum required number of two credit ratings, nine eligible governments (one state, three counties, and five cities) have ratings only from one credit rating firm; and one eligible government (one county) has no credit ratings.

further. Eligible issuers could not be insolvent and must have had an investment-grade credit rating from at least two nationally recognized statistical rating organizations. Table 3 shows that as of April 2020, out of 256 directly eligible governments, 10 governments had a single credit rating, while one government had no credit ratings at all. Notice, however, that all but one had an investment-grade credit rating, primarily in Aaa/AAA and Aa/AA rating notches, with 18 in A/A and only five in Baa/BBB rating notches.

An important feature of the MLF is its eligible purchases, as the facility is only allowed to purchase short-term notes. Eligible notes include bond anticipation notes, tax anticipation notes, tax and revenue anticipation notes, and other similar short-term securities. The maximum term to maturity of a note is 36 months. Also, the MLF has a detailed pricing schedule that lays out the base interest rate and basis point spreads across credit ratings, and pricing for Fed origination services.

When discussing the MLF, it is also important to contextualize it from a political economy perspective. While the CARES Act that authorized the MLF was swiftly passed in Congress and quickly signed by President Trump as an emergency measure due to the pandemic, unease about the MLF in terms of its potential impact on the municipal securities market and the long-term financial condition of state and local governments were voiced shortly after enactment. The primary concern was related to how a potential expansion of the MLF could ultimately lead to a "nationalization of state and local finance" (Joffe, 2020). Because of the size of the Federal Reserve Bank's balance sheet, some observers were worried that the Fed would ultimately serve as the primary or even sole lender to state and local governments, which could eliminate the need for the municipal securities market.

Minimization or complete elimination of the municipal securities market was disturbing to these observers as they viewed it as the primary means for fiscal autonomy and of imposing fiscal discipline on state and local governments. Specifically, the need to access future capital via the private sector in the municipal securities market required state and local governments to annually balance their budgets and engage in prudent fiscal and financial management practices. Unlimited deficit-financed funding resourced by the federal government, it was argued, would not only reward governments who previously mismanaged their finances with cheap access to capital but would disincentivize otherwise financially prudent state and local governments from engaging in sound long-term fiscal management practices (Joffe, 2020).

Concerns about expansion of the MLF were heightened when the program was extended by three months from September 30 to December 31, 2020, and when more governments were made eligible to use the facility. Also, the loan term maturity was extended from 2 to 3 years,

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while the penalty interest rate premium was reduced by 50 basis points. Such concerns were at least temporarily assuaged in November 2020 when Treasury Secretary Steve Mnuchin announced that the MLF program would be allowed to sunset on December 31, 2020 due to the facility having "achieved its objective" (Wynn, 2020a). Some municipal market participants agreed with Secretary Mnuchin's assessment. Moreover, the expiration of the MLF mitigated fiscal federalism concerns about ceding state and local government debt financing authority, and therefore, fiscal autonomy, to the Federal Reserve.

However, the Federal Reserve Board, some members of Congress, and other municipal participants disagreed with the Secretary, preferring that the MLF be extended given the economic uncertainties that were expected to continue, at least in the short term (Wynn, 2020b). There were other observers that not only wanted the MLF extended but advocated that President-elect Biden, once in office, expand the program substantially by allowing all state and local governments access to the program, lending at the lowest rates possible (presumably not at penalty rates as the MLF was structured before expiration), and structuring the repayment of the loans for terms of up to 10 years (Sgouros, 2020). This falls in line with earlier preferences of some Democratic members of Congress and market participants that advocated for program expansion beyond liquidity provision to offering Federal Reserve financing for long-term infrastructure projects (Congressional Oversight Committee, 2020). Of course, these publicly-stated expansions are precisely what worried the market participants who were more skeptical of the federal government's intent from the onset of the program.

EMPIRICAL STRATEGY

In this section, we analyze the impact of the MLF on liquidity in the municipal securities market. State and local governments traditionally use short-term debt to adjust their liquidity position to finance revenue and expenditure cash flow mismatches. Our empirical approach is designed to determine if aggregate primary market liquidity was impaired during the pandemic leading up to the Federal Reserve's several liquidity facility interventions, and if so, whether the Fed's intervention, including the activation of the MLF, facilitated improvements in the municipal securities market.

Our analysis adds to a growing literature on the Fed as a market maker of last resort (Buiter & Sibert 2007; Li et al., 2020; O'Hara & Zhou, 2020). Several of these authors argue that the actions taken by the Federal Reserve in response to the 2008 financial crisis, as well as the responses to the current pandemic, reflect the role of the Federal Reserve as the market maker of last resort. This is largely in contrast to the broader literature on state and local government access to liquidity during typical fiscal years. For instance, Su and Hildreth (2018) discuss the role of fiscal slack and the preference for its use when municipal governments experience cash flow problems. Revenue diversification, beyond fiscal slack, Shon and Kim (2019) add, permits local governments to rely less on short-term borrowing and invest more in long-term infrastructure projects. Furthermore, Fisher and Wassmer (2014) showed that during the Great Recession, state and local government use of both short- and long-term debt remained robust, in addition to the use of the federal Build America Bonds program. Of course, the use and the variety of options of short-term securities during the crisis of 2008 to 2009 had been significantly disrupted by the collapse of the auction rate securities market, derivatives, and the meltdown of the monoline bond insurance industry (Johnson et al., 2014; Martell & Kravchuk, 2010, 2012; Moldogaziev, 2013; Singla, 2018).

According to the market maker of last resort theory, however, the Federal Reserve stands ready to step into the market during a period of disorder and, with its virtually unlimited resources, stabilize the market by selling and/or buying securities. In a market liquidity crisis, the Fed pumps funds into the market by directly buying assets to inject liquidity and stabilize asset prices (Buiter &

Sibert, 2007; Li et al., 2020; O'Hara & Zhou, 2020). We believe that the role of market maker of last resort is consistent with what the Federal Reserve intended to accomplish for the municipal securities primary market in establishing the MLF. However, since the Fed took several actions around the same time the MLF was established, some of which were accessible to the dealers and holders of municipal securities as well, we must specify several identification strategies to separate out the potential role of the MLF relative to other liquidity actions by the Fed.

We begin by conducting several pre- and post-liquidity facility intervention tests on the volume of short-term debt issuance. We specifically analyze issuance data from January to July 2020.⁹ Our analysis of new issuance in the municipal securities market recognizes the cross-market risks demonstrated by Li et al. (2020). They show an unprecedented outflow of funds from municipal mutual funds and a substantial decline in dealer liquidity during the onset of the pandemic. This was an important reason for concern because mutual funds represented roughly 30% of the market for outstanding municipal securities at the time. As Li et al. (2020) and related research shows (Gilchrist et al., 2020; O'Hara & Zhou, 2020; Wei & Zue, 2020), other liquidity facilities began impacting the municipal securities market around March 23, 2020. There is no evidence, however, on whether the MLF had a similar calming effect on the municipal securities market when it was activated on April 9, 2020.

SHORT-TERM MATURITY DEALS IN THE PRIMARY MARKET

The MLF was designed to help eligible state and local governments access short-term liquidity in a time of severe uncertainty in the municipal securities market. But does the mid-March to early April period of 2020 represent a blip or a longer-term trend of market instability? What has been the volume of new issuance and trading in short-term municipal securities in the market throughout 2020—before and after Federal Reserve liquidity interventions—and are there indications of a slowdown or breakdown in market activity? More importantly, how much municipal note issuance in typical versus volatile periods, based on historical data, would the MLF be capable of absorbing as a liquidity facility of last resort?

Univariate distributions

Figure 1 shows that short-term issuance in the primary market remained relatively stable in the first, second, and third quarters of 2020. Historical trends, however, show that there were periods of volatility in municipal note issuance volume during an economic downturn in the early 2000s, and especially during and after the financial crisis and Great Recession in 2007–2008 and 2009–2012, respectively.¹⁰

Overall, annual municipal notes issuance from 1986 to 2020 was primarily for general purpose needs, and significantly so during and immediately after the economic recessions. Figure 2 shows that state governments, relative to other types of borrowers, utilized notes rather heavily in the aftermath of economic recessions, with the lag of the Great Recession particularly prolonged relative to previous recessions. During the same 35-year period, almost all note issuances were in tax-exempt securities, new money, and fixed rate notes, almost exclusively supported by general obligation pledges. There is a slight uptick of note utilization by cities and towns, as well as counties and parishes, over the last 15 years.

⁹In several cases, we also use data before and after this time interval. For example, we use information on debt issuance trends during the financial crisis of 2008. ¹⁰The latter is consistent with findings in existing literature that the impact of the Great Recession on municipal government revenues exhibited significant lags after the recession, especially for own source total receipts (Gordon 2012; Harris & Shadunsky, 2013).



FIGURE 1 Quarterly municipal notes issuance, 1986–2020 (data in 2020 includes first three quarters only). *Source: The Bond Buyer*



FIGURE 2 Municipal notes by issuer type, 1986–2020. Data in 2020 includes first three quarters only. *Source: The Bond Buyer*

	Total max MLF eligible	Municipal ne	ote issuance volume, \$ms	
Eligible government	amount, \$ms	2018	2019	2020 ^a
State	268,002	12,904	14,959	13,449
County	29,275	5913	3129	4163
City	42,577	11,210	9841	8153
All other governments ^b		11,506	7804	8601
Grand total	339,854	41,533	35,733	34,366

TABLE 4 Comparison of MLF eligible amount to actual notes issuance volume, 2018–	2020
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Abbreviation: MLF, Municipal Liquidity Facility.

^aData in 2020 includes first three quarters only.

^b"All other issuers" are special purpose districts and local authorities, colleges and universities, direct issuers, tribal governments, and cooperative utilities. Potentially, the total maximum MLF amounts for these borrowers is the remainder of the \$500 billion authorized for the MLF.

Source: The Bond Buyer.

It does not appear that, as of the end of the third guarter of 2020, the municipal note issuance market had been structurally affected by the pandemic in any significantly adverse manner. In particular, state government note issuance in the current crisis had thus far been muted, compared to significant increases in note issuance during prior economic and financial crises. In terms of the funds available in the MLF, however, it appears that the liquidity facility would be able to absorb with ease the short-term notes of not just the eligible issuers, but the notes of all municipal issuers in the primary market as well.¹¹ This can be clearly seen in Table 4. The potential size of liquidity provision, if all eligible state and local governments were to utilize the MLF, adds up to about \$340 billion. Since the MLF was authorized to provide liquidity to eligible state and local governments for up to \$500 billion, that amount would have been sufficient to cover all state and local short-term borrowers, whether eligible or not, for several calendar years.

Furthermore, our review of the municipal primary market activity shows that overall, in 2020, the patterns of state and local government notes issuance and trading were similar to prior periods. There is, however, potentially a lagged impact to state and local government budgets that is to be expected, which could negatively affect municipal notes issuance and trading volumes. Note that numbers from the last 2008 to 2009 financial crisis and the Great Recession, presented in Table 5, imply that there is a lagged effect of crisis on state and local government short-term borrowing. The peak of short-term debt issuance is observed in 2009 and 2010, primarily driven by states and cities, and less so by counties and other types of local governments.

Difference-in-differences (DID) regression analyses

To test the effect of the Federal Reserve's interventions, we evaluate whether there are changes in yield for MLF-eligible issuers that could be attributed to the interventions. We use two

¹¹Trends in municipal secondary market trades also have been relatively steady, indicating that investor demand for municipal securities (based on secondary market trading data, along all maturity categories) is relatively stable. According to data from the Municipal Securities Rulemaking Board, the volume of secondary market trades for municipal securities with maturities of 1 year or less was about 4.7% of total secondary market trading volumes since 2005. Though in the aftermath of the Great Recession this level was between seven and 11%. In recent years, the trades for securities with maturities of 1 year or less remained above 7%. Trades for securities with maturities of 1-5 years, on average, were about 9.2% during the same period, but in the last several years the volume of securities with maturities of 1-5 years in the secondary trades was at least 11% of total volume.

TABLE 5	Municipal	notes issuance	volume, 2008-2011
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	Municipal not	e issuance volume, \$r	ns	
Eligible government	2008	2009	2010	2011
State	31,853	33,328	35,968	32,392
County	6241	6039	6266	6710
City	10,437	10,874	11,027	9914
All other governments ^a	12,285	14,508	12,049	11,626
Grand total	60,817	64,748	65,310	60,642

^aData in 2020 includes first three quarters only. "All other issuers" are special purpose districts and local authorities, colleges and universities, direct issuers, tribal governments, and cooperative utilities.

Source: The Bond Buyer.

different time points as intervention dates in our analysis: March 23, when several liquidity facilities became active, and April 9, when the MLF was established (recall details from Table 1). We use data from Ipreo's Municipal Application over the period January 1, 2019 to June 30, 2020, limiting the sample to those issues for which the data contain the issuer's name, yield, and securities that have a final maturity date less than or equal to 36 months from their sale date (to match the MLF's maturity criterion), resulting in a sample size of 2949 observations at the maturity level. We use the Federal Reserve's list of issuers eligible to use the MLF to define an indicator for the treatment group (the eligible sample is summarized in Table 3). Over the period, there are 229 bond issues by eligible borrowers, 49 of which occur after the Fed's liquidity interventions.

Because the MLF is available only to some municipal securities issuers, the facility lends itself to a quasi-experimental research design, specifically a DID approach. Although eligibility is not randomly assigned to municipal issuers, if the assumptions of the DID research design are met, we can compare the primary market yields of eligible issuers (the treatment group) to ineligible issuers (the comparison group) before and after Federal Reserve liquidity interventions. The validity of the DID research design depends on an assumption that unmeasured confounding variation is limited in form to two types: (1) time-invariant group attributes and (2) factors that vary over time but are common for all groups. Combined, these circumstances imply that any difference between the groups in the observed outcome variable remains constant over time, prior to treatment. In that case, differences between the two groups after the Fed's liquidity interventions can be attributed to the policy change.

We test the validity of this assumption with an event study regression. We create indicator variables for each week prior to treatment and each week after treatment. The variables—or events—are equal to one for bonds issued that week by eligible issuers, with the exception of the week prior to treatment, which is equal to zero for issues by either eligible or ineligible issuers. Bonds by ineligible issuers are equal to zero at all times, as they are the comparison group. A trend in pre-treatment events would mean that differences in the outcome variable—here, primary market yield—between the two groups are in fact changing over time for eligible and ineligible issuers, which would make the DID research design invalid.

Figures 3 and 4 depict in graphical form the results of our event study regressions for treatments in the week of March 23, 2020 and April 9, 2020, respectively. Though the pretreatment events are noisy (due to analysis at the weekly level, as is necessary in this case due to sparsity of deals) and, at times, statistically significant, no consistent trend is noticeable. Therefore, we believe the DID research design to be valid for this analysis. Figures 3 and 4 also show the most relevant information from the DID regressions. These regressions are of the following form:









$$Yield_{it} = \beta_0 + \beta_1 Post_t \times Eligible_i + \gamma_i + \delta_t + \epsilon_{it}, \tag{1}$$

where, i is a maturity; t the week of issue; β_0 and β_1 are the intercept and slope coefficients; $Post_t \times Eligible_i = 1$ if issued posttreatment and by an eligible issuer; γ the issuer fixed effects; δ the week fixed effects; and ϵ_{it} the standard errors clustered at the state level.

Neither the event study nor the DID regressions include control variables for bond, issuer, or market characteristics as is typical in bond pricing studies. This omission is deliberate because the question of interest in our study is at the market level, not at the individual issue level. The fixed effects for issuers control for time-invariant differences between eligible and ineligible issuers, while the week fixed effects control for changes over time that affect eligible and

ineligible issuers in common. The coefficient of interest, β_1 , is an estimate of the difference in yield on bonds issued by eligible versus ineligible issuers after treatment.

Empirical results show that for both March 23, 2020 and April 9, 2020 treatment dates, the variable of interest $Post_t \times Eligible_i$ has a parameter estimate of 0.002, with a standard error of 0.002. This means that we find no statistically significant evidence of an effect on primary market yields from liquidity intervention programs of the Federal Reserve, be it the MLF intervention or otherwise. This is consistent with the municipal primary notes issuance activity, which we discussed in the previous sub-section. Overall, we do not have sufficient evidence to conclude that, at the aggregate market level, federal liquidity facility interventions affected primary market yields for either eligible or ineligible municipal issuers.

MLF PRICING AND MARKET RATES

To reiterate, the MLF was authorized to provide significant liquidity support to eligible state and local governments (50 states and the District of Columbia, large cities and counties, and limited designated issuers per state including smaller cities/counties and issuers whose resources are significantly derived from business-type activities, such as toll and transit agencies). However, during the program's existence through December 31, 2020, only two government entities borrowed from the MLF.

The first borrower, and the only general government, was the State of Illinois. It borrowed \$1.2 billion on June 2, 2020 at an initial interest rate of 3.82% for a 1-year loan and \$2 billion on December 17, 2020 with an initial interest rate of 3.42% for a 3-year loan (Shields, 2020a, 2020b). The other issuer was the Metropolitan Transportation Authority of New York (MTA), which borrowed \$451 million in August 2020 at a 1.93% interest rate for a 3-year loan and \$2.9 billion in December 2020 at a 1.33% interest rate for a 3-year loan. Other borrowers reportedly considered using the MLF, including the State of New Jersey, but no issuers other than Illinois and MTA used the facility (Burton, 2020; Funk & Albano, 2020; Shields, 2020b).

Univariate distributions

Why did so few state and local governments utilize the MLF? One reason may be the MLF's high base rate and credit spreads relative to pricing available for short-term securities in the municipal bond market. Pricing under the MLF is set at a premium. Governments must pay a spread over the overnight index swap (OIS) rate for a comparable maturity based on their long-term credit rating. (The credit rating-based pricing spread is detailed in the lower part of Table 2.) As an example, if the 1-year OIS rate was 0.10%, based on the latest credit spread criteria, a AAA/ Aaa rated government would pay 1.10% (i.e., 10 basis points plus 100 basis points) under the MLF for a 1-year tax-exempt note. The government also would have to pay the Federal Reserve a 0.10% origination fee on the par amount of the notes, per the term sheet.

Thus, we constructed hypothetical MLF rates by adding the daily, 1-year OIS rate to the MLF credit spread from the middle of each rating category for AAA, AA, A and BBB (i.e., 100 basis points for AAA, 125 for AA, 200 for A, and 290 for BBB). We can do so for periods before 2020 as well—for instance, on September 16, 2015, the 1-year OIS rate was 0.431% and, thus, the constructed MLF rates would be 1.431%, 1.681%, 2.431%, and 3.331% for the AAA, AA, A, and BBB rating categories, respectively. The spread between the OIS rate and AAA/Aaa rate established by the Federal Reserve represents both credit and term-to-maturity spreads. The Fed established the initial spread at 150 basis points for AAA/Aaa-rated governments, as seen in Table 2. Based on public complaints and the lack of take-up, the Fed lowered the rate by 50 basis points across all rating categories in August 2020, with AAA/Aaa-rated governments



FIGURE 5 Time-series distribution of MMD (1-year) rates and MLF-MMD spread. MLF, Municipal Liquidity Facility; MMD, Municipal Market Data

paying a rate of OIS plus 100 basis points. But was a base rate of OIS plus credit rating spread low enough to attract state and local governments across all credit ratings?

A historical analysis of constructed MLF rates versus municipal bond interest rates across rating categories can help answer this question. To begin with, Figure 5a, charts the daily, taxexempt, 1-year AAA/Aaa, AA/Aa, A, and BBB/Baa Municipal Market Data (MMD) rates, while Figure 5b depicts these rates against the constructed 1-year maturity MLF rate for each rating category. The range of presented data in the figure is from January to October 2020. MMD is a proprietary daily yield curve published by Thomson Reuters for state general obligation bonds at different credit ratings. We can observe that the peak of 1-year MMD rates across all credit rating categories was on March 23, 2020, represented by a vertical line on the left. The vertical line on the right is set for April 9, 2020, which is the date of MLF activation. It can be seen that the MMD rates were on a sharp downward trend after March 23, 2020 and settled on a flatline around May 20, 2020. Observe, however, that the rates for MMD 1-year BBB/Baa credit category remained significantly distinct from other investment grade categories.

In Figure 5b, we plot the constructed MLF to MMD spreads for each investment grade category, which shows the relative pricing of the MLF option versus the market rates for short-term borrowing. We can infer that borrowing from the MLF may have been attractive for the average issuer only during the third and fourth weeks of March 2020, and perhaps during the first week of April 2020. The turning point in this plot is March 23, 2020, and by the time the MLF was activated on April 9, 2020, all investment grade categories were better off borrowing directly in the municipal securities market.

To offer further details, Table 6 presents the spread differences between the constructed MLF rates and MMD for all four rating categories for the 5-year period. The daily average spread during the period September 2015 to 2020 (the spread being defined as the MLF rate minus the MMD rate) was 1.273%, 1.495%, 2.106%, and 2.653% for each investment grade rated bond category, respectively. A positive spread indicates that the MLF rate is higher than MMD and vice versa. The maximum spread among all four rating categories was 3.33%, which occurred in the BBB/Baa category and the minimum spread was -1.43%, which occurred in the AAA/Aaa rating category. The MLF rate was lower than the MMD rate most frequently during the 5-year

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TABLE 6 Pricing differences summary, constructed MLF and MMD (September 16, 2015 to September 16	FABLE 6	Pricing differences summar	, constructed MLF and MMD (Se	eptember 16, 2015 to Septem	ber 16, 2020)
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	AAA	AA	Α	BBB
Average spread (MLF minus MMD)	1.27%	1.50%	2.11%	2.65%
Minimum spread (MLF minus MMD)	-1.43%	-1.21%	-0.50%	-0.14%
Maximum spread (MLF minus MMD)	1.89%	2.13%	2.70%	3.33%
Number of days MLF less than MMD	14	7	3	2

Abbreviations: MLF, Municipal Liquidity Facility; MMD, Municipal Market Data.



FIGURE 6 Time-series distribution of MMD-treasury and SIFMA-treasury (1-year) spreads. MMD, Municipal Market Data

period for the AAA rating category (14 days) and least frequently for BBB rating category (2 days). This confirms, once again, that the benefit of the MLF over MMD would have been exclusively in the mid- to late March and early April window in 2020.

A similar picture of the municipal market rate hike in March 2020 and subsequent stabilization is observed in Figure 6. Figure 6a depicts the spread between MMD 1-year AAA/Aaa rate and the Treasury 1-year yield, while Figure 6b is for the spread between SIFMA's 7-day index (consisting of tax-exempt VRDOs) and the Treasury 1-year yield. A visual inspection of both panels clearly shows that state and local governments would have been substantially better off borrowing from the municipal securities market compared to the Federal Reserve's MLF vehicle, except for the mid- to late March and early April window in 2020.

Interrupted time-series analyses

Again, following recent findings about liquidity facilities activated in March 2020, in addition to the date of activation of the MLF on April 9, 2020, we estimate a set of interrupted time-series analyses (ITSA). For reasons of brevity, we offer regression results from the models with the best and preferred fit only. As in the previous section, two primary intervention dates are evaluated

in the regression models: March 23, 2020 and April 9, 2020. We use ITSA models to account for potential autocorrelation and nonlinearity in the outcomes of interest (Linden, 2015). All models, except the last SIFMA-Treasury (1-year) spread regression model that did not require correction for autocorrelation, have robust Newey–West first-order autoregressive random errors. The final general form for ITSA regressions is

$$Y_t = \beta_0 + \beta_1 T_t + \beta_2 X_t + \beta_3 X_t T_t + \epsilon_t,$$
⁽²⁾

$$\epsilon_t = \rho \epsilon_{t-1} + u_t, \tag{3}$$

where t is the day of issue; β_0 , β_1 , β_2 , and β_3 are the intercept and slope coefficients; X = 1 is an intervention; T is the time trend; ϵ_t is the error term, which is equal to $\rho \epsilon_{t-1} + u_t$ when the robust Newey–West first-order autoregressive error correction is applied.

Results from the interrupted time-series analysis models are presented in Tables 7 and 8. The first of these tables contain results for MLF-MMD spreads for each investment grade category, while the second table contains regression results for MMD and SIFMA rates versus Treasury's 1-year yields, with two intervention scenarios—March 23, 2020 and April 9, 2020. Two key take-away conclusions are drawn here. The first is that the "Pre- vs. postintervention" coefficients are significant in all of the models. In general, however, the *F*-test (model fit) statistics and the linear combination trends show that the intervention date of March 23, 2020 must be preferred.

This is supported by significant coefficients for "Intervention" for the March 23, 2020 models, while the same coefficients for April 9, 2020 models are insignificant. The sole exception in all these models is that both the March 23, 2020 and April 9, 2020 interventions appear to be statistically significant for the MLF-MMD 1-year BBB/Baa spread. That is, if the MLF had been found attractive by state and local issuers, the lowest investment grade borrowers would have been the only ones opting for it. This finding is consistent with the fact that only borderline investment grade borrowers used or contemplated using the MLF (e.g., State of Illinois, MTA, State of New Jersey).

In Figures 7–10, we depict the predicted levels of MLF-MMD spreads for each credit rating category discussed above. All these spreads experienced increasing trends after the March 23, 2020 intervention, making the MLF option less and less desirable over time. Figures 11 and 12 show the predicted spreads for short-term municipal market borrowing relative to the Treasuries. In both figures, where the MMD rate is daily and SIFMA is weekly, regression results confirm that the risks in the municipal debt market relative to Treasuries decreased significantly after the March 23, 2020 intervention date.

CONCLUSIONS AND POLICY IMPLICATIONS

Several practical conclusions with regards to program take-up can be drawn from the analysis of historical rate comparisons of the constructed MLF and MMD interest rates and the regression results presented in the previous two sections (as well as the notional MLF take-up example from Texas in Appendix A). First, the MLF is priced at such a premium that it did not make sense for the vast majority of governments to use the MLF, except for a brief period of time when the municipal securities market was in turmoil at the onset of the COVID-19 pandemic. Even the latest attempts in August 2020 to make the MLF pricing more attractive appear insufficient.

Second, the fact that the MLF would have made sense for some state and local governments to use in the mid-March to early April 2020 period seems to provide support for the Federal Reserve's role as a liquidity backstop. While it did not make sense for most governments to use it because the municipal securities market has continued operating normally in recent months, the MLF, as officially priced, would have offered certain governments access to more cost-

Variables	MLF-MMD AAA	/Aaa 4/9/2020	MLF-MMD AA/ 3/23/2020	Aa 4/9/2020	MLF-MMD A 3/23/2020	4/9/2020	MLF-MMD BBB 3/23/2020	//Baa 4/9/2020
Time trajectory	-0.00389	-0.00835***	-0.00389	-0.00835***	-0.00373	-0.00827***	-0.00441	-0.00978***
	(-1.78)	(-4.27)	(-1.78)	(-4.27)	(-1.72)	(-4.22)	(-1.84)	(-4.44)
Intervention	-0.953***	-0.150	-0.962***	-0.166	-1.024***	-0.244	-1.379***	-0.620**
	(-4.72)	(-0.76)	(-4.78)	(-0.84)	(-5.17)	(-1.24)	(-6.50)	(-2.85)
Pre- vs. postintervention	0.0131***	0.0147***	0.0130***	0.0147***	0.0130***	0.0151***	0.0107***	0.0146***
	(5.08)	(7.08)	(5.04)	(7.06)	(5.15)	(7.35)	(4.03)	(6.50)
Constant	1.518***	1.738***	2.422***	3.059***	1.711***	1.931***	2.619***	3.293***
	(15.93)	(18.23)	(25.59)	(29.31)	(17.18)	(19.39)	(26.31)	(29.31)
Time units	251	251	251	251	251	251	251	251
F-test	94.22	66.17	96.96	69.06	125.21	92.00	478.92	221.08
Probability (F-test)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Linear trend	0.0092***	0.0064***	0.0091***	0.0063***	0.0092***	0.0068***	0.0062***	0.0048***
	(7.90)	(9.18)	(7.87)	(9.21)	(8.67)	(11.63)	(7.14)	(11.78)

TABLE 7 Tabular ITSA regression results for MLF-MMD 1-year spreads

Note: t Statistics in parentheses.

Abbreviations: ITSA, interrupted time-series analyses; MLF, Municipal Liquidity Facility; MMD, Municipal Market Data. p < 0.05; p < 0.01; p < 0.00. 19

	MMD-treasury (1-Y)	SIFMA-treasury	(1-Y)
Variables	3/23/2020	4/9/2020	3/23/2020	4/9/2020
Time trajectory	0.00504*	0.00930***	0.0694**	0.0263**
	(2.47)	(5.02)	(3.39)	(2.97)
Intervention	0.872***	0.0620	-3.005**	0.954
	(4.53)	(0.32)	(-3.04)	(1.30)
Pre- vs. postintervention	-0.0139***	-0.0151***	-0.0709**	-0.0425***
	(-5.62)	(-7.57)	(-3.46)	(-3.69)
Constant	-0.712***	-0.896***	-1.547**	-0.856***
	(-8.26)	(-10.03)	(-3.09)	(-3.60)
Time units	251	251	40	40
F-test	120.26	80.63	4.91	5.36
Probability (F-test)	0.000	0.000	0.006	0.004
Linear trend	-0.0089***	-0.0058***	-0.0015*	-0.0162*
	(7.38)	(7.87)	(1.77)	(2.20)

TABLE 8 Tabular ITSA regression results for MMD-treasury (1-year) and SIFMA-treasury (1-year) spreads

Note: t Statistics in parentheses. Time units for the MMD-Treasury spread are daily for 9/2020–9/2020; Time units for the SIFMA-Treasury spread are weekly for 1/2020–9/2020.

Abbreviations: ITSA, interrupted time-series analyses; MMD, Municipal Market Data.

p* < 0.05; *p* < 0.001; ****p* < 0.01.



FIGURE 7 ITSA regression results for March 23, 2020 fed intervention, MLF-MMD AAA/Aaa spread. ITSA, interrupted time-series analyses; MLF, Municipal Liquidity Facility; MMD, Municipal Market Data

efficient liquidity. Ostensibly, this market maker of last resort effect was the point of the Federal interventions.

Third, it appears that earlier liquidity facility interventions by the Federal Reserve, which offered access to liquidity to certain dealers and institutional investors of municipal securities, brought relative stability to the municipal securities market before the MLF itself was put to





FIGURE 8 ITSA regression results for March 23, 2020 fed intervention, MLF-MMD AA/Aa spread. ITSA, interrupted time-series analyses; MLF, Municipal Liquidity Facility; MMD, Municipal Market Data



FIGURE 9 ITSA regression results for March 23, 2020 fed intervention, MLF-MMD A/A spread. ITSA, interrupted time-series analyses; MLF, Municipal Liquidity Facility; MMD, Municipal Market Data

work. Thus, it is difficult to parse out the impact of the MLF above and beyond the roles of other liquidity facilities at the aggregate primary market yield and rate spread levels of analysis.¹² However, the finding that both March and April 2020 Federal Reserve interventions were significant for the lowest investment grade rate spreads may indicate that the facility would have been desired by borrowers of lower credit quality. Whether liquidity to non-investment grade issuers should be provided directly by the federal rather than state governments (and, perhaps, also act as pass-throughs of funds from the MLF) is a separate normative and empirical question.

¹²Potentially, an alternative test of the effect of the MLF on municipal securities rates could be completed for secondary market transactions, especially for seasoned bonds. This disintegrated, deal-level analysis would capture the latent yield for each potential borrower. However, even this approach would not be appropriate for all state and local governments because of the lack of liquidity in the municipal securities market, where there are not always secondary trades that one could observe for all municipal issuers. That is, the secondary market would reflect the same phenomenon that there needs to be a willing buyer or seller of securities as in the primary market, but one may not always exist even for seasoned trades due to illiquidity.



FIGURE 10 ITSA regression results for March 23, 2020 fed intervention, MLF-MMD BBB/Baa spread. ITSA, interrupted time-series analyses; MLF, Municipal Liquidity Facility; MMD, Municipal Market Data



FIGURE 11 ITSA regression results for March 23, 2020 fed intervention, MMD-treasury (1-year) spread. ITSA, interrupted time-series analyses; MMD, Municipal Market Data

Fourth, and supplementary to the third conclusion above, it appears that had the MLF program been in place during the most tumultuous time in the municipal market at the onset of COVID-19, higher-rated governments, on average, would have seen greater benefits in terms of interest rate spread than lower-rated governments. This mitigates concerns of the MLF serving as a back-door federal bailout to governments that may not have been properly managing their finances prior to the pandemic. In other words, while lower-rated state and local governments may have wished they were let into the program, it is their higher-rated peers that would have benefited the most from the MLF if the markets remained volatile.

Finally, it should be noted that just because it did not make sense for most governments to use the MLF program in the market environment after the March 23, 2020 policy intervention, that does not mean the MLF program would not be useful in the future. If the national economy were to deteriorate further as a result of continued COVID-19 impact, and if the Fed's liquidity spreads were narrower, one could see the benefits of the MLF as a more economically beneficial borrowing option to more state and local governments.



FIGURE 12 ITSA regression results for March 23, 2020 fed intervention, SIFMA-Treasury (1-year) Spread. ITSA, interrupted time-series analyses

In terms of theoretical implications, the MLF was conceived and implemented at the beginning of the COVID-19 pandemic when the municipal securities market began seeing a large spike in short-term interest rates. This generated uncertainty regarding future market access, especially with regards to liquidity. The Federal Reserve, supported by the U.S. Treasury, definitively signaled to the market that it would step into the breach and provide back-up liquidity support to those that needed it. We believe that the actions of the Fed in providing back-up liquidity facilities likely helped stabilize the short-term markets over the subsequent months, including short-term borrowing in the municipal securities market, despite the dearth of participation by municipal issuers in the MLF.

Only two issuers have borrowed from the MLF. We do not consider this to be a failure of the facility, however. We consider it to be an indicator of two things: (1) the short-term municipal market effectively rebounded from a few weeks of an interest rate spike, in the context of continued pandemic uncertainty, and (2) the initial Fed interventions calmed the short-term market volatility, offering liquidity to dealers and large institutional investors in municipal debt, all while the municipal securities market continued to operate normally. It should also be noted that the Federal Reserve demonstrated its credible intention of meeting the needs of state and local governments by completing the series of changes to the MLF, even when market activity and market rates normalized over the summer of 2020.

The full impact of the COVID-19 pandemic is yet to be known and it continues to bring uncertainty to the capital markets as of the MLF's expiration. Yet, a stronger market signal, with a new MLF, could also be coupled with an effort to make federal loans more attractive should such a need arise again. One policy change could be to reduce the spread to OIS across all rating categories. Table 9 details the pricing differences between constructed MLF and MMD rates assuming three scenarios: (1) the original May 2020 MLF spreads, (2) the revised August 2020 MLF spreads, and (3) a further 50 basis point reduction from the August 2020 MLF spreads. A 50 basis point reduction from August 2020 spreads would have increased the number of days that the MLF realized better pricing compared to MMD from 14 to 44 days for AAA borrowers, and 7 to 39 days for AA borrowers. However, for lower-rated borrowers—A and BBB rated governments—the increase would be only from 3 to 5 and 2 to 4 days, respectively. The Federal Reserve may, therefore, want to consider a larger spread reduction for lower-rated issuers, if making the program even more accessible to these issuers is desired.

We also noted that the MLF had the capacity to service a much larger pool of state and local governments. The Fed could then consider expanding the pool of eligible issuers in any future

		AAA	AA	Α	BBB
May 2020 MLF spread					
Average spread (MLF minus	MMD)	1.77%	2.00%	2.61%	3.15%
Minimum spread (MLF minus	s MMD)	-0.93%	-0.71%	0.00%	0.36%
Maximum spread (MLF minu	s MMD)	2.39%	2.63%	3.20%	3.83%
Number of days MLF less that	in MMD	5	4	0	0
August 2020 MLF spread					
Average spread (MLF minus	MMD)	1.27%	1.50%	2.11%	2.65%
Minimum spread (MLF minus	s MMD)	-1.43%	-1.21%	-0.50%	-0.14%
Maximum spread (MLF minu	s MMD)	1.89%	2.13%	2.70%	3.33%
Number of days MLF less that	in MMD	14	7	3	2
Future reduction in MLF spread	l (0.50%)				
Average spread (MLF minus	MMD)	0.77%	1.00%	1.61%	2.15%
Minimum spread (MLF minus	s MMD)	-1.93%	-1.71%	-1.00%	-0.64%
Maximum spread (MLF minu	s MMD)	1.39%	1.63%	2.20%	2.83%
Number of days MLF less that	n MMD	44	39	5	4

TABLE 9 Pricing differences summary, constructed MLF and MMD (September 16, 2015 to September 16, 2020)

Abbreviations: MLF, Municipal Liquidity Facility; MMD, Municipal Market Data.

MLF. This could potentially mean that a much more diverse group of borrowers, both in terms of credit quality and type, would need to be considered. When dealing with a larger pool of potential borrowers, it would be reasonable for the Fed to consider lowering credit spreads to reflect a lower premium,¹³ and creating separate interest rate schedules for state, county, and city levels of government. As our examples in Appendix B show, greater pricing efficiencies could be achieved by doing so. The municipal securities market consists of heterogeneous borrowers, and a single rate structure is unlikely to produce optimal results for both the MLF and the diverse forms of state and local governance arrangements. It is likely, however, that any such attempts to offer liquidity directly to a wider group of municipal governments will run into even stronger concerns of federal control and weakening of municipal securities market autonomy, as was the case with the opposition against the expired MLF.

REFERENCES

Board of Governors of the Federal Reserve System. 2020a. "Report to Congress Pursuant to Section 13(3) of the Federal Reserve Act: Municipal Liquidity Facility." April 16. Effective April 9, 2020.

Board of Governors of the Federal Reserve System. 2020b. "Federal Reserve Board announces revised pricing for its Municipal Liquidity Facility." August 11.

Board of Governors of the Federal Reserve System. 2020c. "Periodic Report: Update on Outstanding Lending Facility Authorized by the Board under Section 13(3) of the Federal Reserve Act." May 23.

Board of Governors of the Federal Reserve System. 2020d. "Periodic Report: Update on Outstanding Lending Facility Authorized by the Board under Section 13(3) of the Federal Reserve Act." June 14.

Board of Governors of the Federal Reserve System. 2020e. "Periodic Report: Update on Outstanding Lending Facilities Authorized by the Board under Section 13(3) of the Federal Reserve Act." May 15.

¹³12 CFR sec. 201.4(d)(7) requires the Fed to charge borrowers of an emergency lending facility a penalty rate that "is a premium to the market rate in normal circumstances," but it does not specify interest rate levels, or a required base rate or credit spread.

- Board of Governors of the Federal Reserve System. 2020f. "Periodic Report: Update on Outstanding Lending Facilities Authorized by the Board under Section 13(3) of the Federal Reserve Act." July 9.
- Board of Governors of the Federal Reserve System. 2020g. "Periodic Report: Update on Outstanding Lending Facilities Authorized by the Board under Section 13(3) of the Federal Reserve Act." August 10.
- Board of Governors of the Federal Reserve System. 2020h. "Periodic Report: Update on Outstanding Lending Facilities Authorized by the Board under Section 13(3) of the Federal Reserve Act." September 7.
- Board of Governors of the Federal Reserve System. 2021. "Periodic Report: Update on Outstanding Lending Facilities Authorized by the Board under Section 13(3) of the Federal Reserve Act." January 9. Board of Governors of the Federal Reserve System. Municipal Liquidity Facility Term Sheet. Effective April 9, 2020.

Board of Governors of the Federal Reserve System. "Municipal Liquidity Facility Term Sheet." Effective May 11, 2020.

Board of Governors of the Federal Reserve System. "Municipal Liquidity Facility Term Sheet." Effective June 3, 2020.

Buiter, Willen, and Anne Sibert. 2007. "The Central Bank as the market maker of last resort: From lender of last resort to market maker of last resort." VoxEU. Accessed August 1, 2021. https://voxeu.org/article/subprime-crisis-what-central-bankers-should-do-and-why

Board of Governors of the Federal Reserve System. "Municipal Liquidity Facility Term Sheet." Effective August 11, 2020. Burton, Paul. 2020. "Reeling NY MTA Taps into \$2.9 Billion Fed Facility." The Bond Buyer, December 10, 2020, accessed

January 5, 2021, https://www.bondbuyer.com/news/reeling-new-york-mta-taps-into-2-9b-fed-facility

Code of Federal Regulations (CFR). 12 CFR sec. 201.4(d)(7), accessed June 22, 2021 from the Legal Information Institute, Cornell Law School, https://www.law.cornell.edu/cfr/text/12/201.4

Congressional Oversight Committee. 2020. "The Fifth Report of the Congressional Oversight Committee," October 15, 2020, accessed January 8, https://naco.sharefile.com/share/view/s82b938be86f4d1da

Federal Reserve Bank of New York. "FAQs: Municipal Liquidity Facility." Effective September 8, 2020.

Federal Reserve Bank of New York. "FAQs: Municipal Liquidity Facility." Effective August 11, 2020.

Federal Reserve Bank of New York. "FAQs: Municipal Liquidity Facility." Effective May 11, 2020.

- Fisher, Ronald C., and Robert W. Wassmer. 2014. "The Issuance of State and Local Debt During the United States Great Recession." *National Tax Journal* 67(1): 113–150.
- Funk, Lynne, and Christine Albano. 2020. "NY MTA Rejects Bids, Heads to Fed," *The Bond Buyer*, August 18, 2020, accessed January 29, 2021, https://www.bondbuyer.com/news/new-york-mta-sells-second-large-deal-to-federal-reserve
- Gilchrist, Simon, Bin Wei, Vivian Z. Yue, and Egon Zakrajšek. 2020. "The Fed Takes on Corporate Credit Risk: An Analysis of the Efficacy of the SMCCF," NBER Working Paper 27809, September 2020.

Gordon, Tracy. 2012. State and Local Budgets and the Great Recession. Washington, DC: Brookings Institute.

- Harris, Benjamin H., and Yuri Shadunsky. 2013. State and Local Governments in Economic Recoveries: This Recovery is Different. Washington, DC: Urban-Brookings Tax Policy Center.
- H.R. 748 Coronavirus Aid, Relief, and Economic Security Act (CARES Act). 116th Cong., 2d Sess. March 27, 2020.
- Joffe, Marc. 2020. "Will the Fed Kill the Municipal Bond Market?," *The Bond Buyer*, June 30, 2020, accessed on January 8, 2021, https://www.bondbuyer.com/opinion/will-the-fed-kill-the-municipal-bond-market
- Johnson, Craig L., Martin J. Luby, and Tima T. Moldogaziev. 2014. State and Local Financial Instruments: Policy Changes and Management. Northampton, UK: Edward Elgar Publishing
- Li, Yi, Maureen O'Hara, and Xing(Alex) Zhou. 2020. "Mutual Fund Fragility, Dealer Liquidity Provisions, and the Pricing of Municipal Bonds," November.
- Linden, Ariel. 2015. "Conducting Interrupted Time-Series Analysis for Single- and Multiple-Group Comparisons." The Stata Journal 15(2): 480–500.
- Martell, Christine R., and Robert S. Kravchuk. 2010. "Bond Insurance and Liquidity Provision: Impacts in the Municipal Variable Rate Debt Market, 2008-09." *Public Finance Review* 38(3): 378–401.
- Martell, Christine R., and Robert S. Kravchuk. 2012. "The Liquidity Crisis: The 2007–2009 Market Impacts on Municipal Securities." *Public Administration Review* 72(5): 668–677.
- Moldogaziev, Tima T. 2013. "The Collapse of the Municipal Bond Insurance Market: How Did We Get Here and Is There Life for the Monoline Industry Beyond the Great Recession? *Journal of Public Budgeting, Accounting & Financial Management* 25(1): 199–233.
- O'Hara, Maureen, and Xing(Alex) Zhou. 2020. "Anatomy of a Liquidity Crisis: Corporate Bonds in the Covid-19 Crisis," Working paper, August 2020.
- Sgouros, Tom. 2020. "Build Back Better? Start with the Fed's MLF," *The Bond Buyer*, December 21, 2020, accessed January 8, 2021. https://www.bondbuyer.com/opinion/build-back-better-start-with-the-feds-mlf
- Shields, Yvette. 2020a. "Illinois Is First to Use Fed MLF Program in \$1.2 Billion Deal," *The Bond Buyer*, June 2, 2020, accessed January 2, 2021. https://www.bondbuyer.com/news/illinois-is-first-to-use-fed-mlf-program-in-1-2-billion-deal
- Shields, Yvette. 2020b. "Illinois Pockets \$2 Billion Fed Municipal Liquidity Loan," *The Bond Buyer*, December 18, 2020, accessed January 5, 2021. https://www.bondbuyer.com/news/illinois-pockets-2b-fed-mlf-loan
- Shon, Jongmin, and Junghack Kim. 2019. "The Impact of Revenue Diversification on Municipal Debts: Comparing Shortterm and Long-term Debt Levels." *Local Government Studies* 45(2): 241–61.
- Singla, Akheil. 2018. "The Rise and Fall of the Municipal Swaps and Derivative Market." Municipal Finance Journal 39(3): 33–59.

- Su, Min, and W. Bartley Hildreth. 2018. "Does Financial Slack Reduce Municipal Short-term Borrowing?," *Public Budgeting* and Finance 38(1): 95–113.
- Wei, Bin, and Vivian Zhanwei Yue. 2020. "The Federal Reserve's Backstops to the Municipal Bond Market during the COVID-19 Pandemic." Federal Reserve Bank of Atlanta. Policy Hub. No.05-2020.
- Wynn, Sarah. 2020a. "Mnuchin Pulls Year-end Plug on Municipal Liquidity Facility," The Bond Buyer, November 19, 2020, accessed January 8, 2021, https://www.bondbuyer.com/news/mnuchin-wont-let-fed-extend-municipal-liquidityfacility
- Wynn, Sarah. 2020b. "Without Fed's MLF, Stakeholders Warn of Fragile Future for Munis," The Bond Buyer, November 20, 2020, accessed January 8, 2021, https://www.bondbuyer.com/news/without-the-feds-mlf-stakeholders-warn-of-afragile-muni-market

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APPENDIX A: A NOTIONAL MLF TAKE-UP ILLUSTRATION

Next, we provide further insight into the question of MLF take-up by providing an analysis of an actual tax and revenue anticipation note (TRAN) sale by the State of Texas in September 2020. State and local governments in Texas were eligible to borrow up to \$16.7 billion under the MLF.¹⁴ Given its sizeable cash flow financing needs, the MLF program had the potential to help the State of Texas' finances. For example, Texas has borrowed extensively in recent years to help manage cash flow in the unrestricted accounts of its general revenue fund. The state sold TRANs in the following amounts and years: \$5.4 billion in fiscal year 2015, \$5.4 billion in fiscal year 2018, \$7.2 billion in fiscal year 2020. However, when it came time to issue its annual TRAN financing in fiscal year 2021, Texas passed on the MLF. Specifically, Texas issued \$7.2 billion in TRANs on September 2, 2020 with a maturity of August 26, 2021 to avoid a temporary cash flow shortage through a traditional municipal note sale rather than the use of MLF.¹⁵

To evaluate the justification for this decision, we compare the actual bond market for TRANs and estimated pricing under an MLF note. In terms of data, we gathered the pricing data from the TRANs' official statement from the Electronic Municipal Market Access (EMMA) website. We gathered the 1-year OIS rate (the TRANs' maturity was approximately 1 year) as of August 19, 2020, the pricing date of the TRANs, from Bloomberg. We assumed a three dollar per bond underwriter's discount on the TRANs, a 0.10% origination fee on the MLF note, and a flat \$200,000 cost of issuance fee under both financing scenarios.

In terms of actual bond market pricing for the State of Texas TRANs as of August 19, 2020, the coupon rate and yield, respectively, were 4% and 0.24%. With respect to MLF pricing (since the State of Texas is rated AAA/Aaa by both Standard & Poor's and Moody's), its spread to the OIS rate would have been 100 basis points. The OIS rate for a 1-year maturity as of August 19, 2020 was 0.053%, which resulted in an interest rate under the MLF note of 1.053%. The MLF note was assumed to be sold at par to the Federal Reserve; so, its coupon rate is equal to its yield. The use of proceeds was \$7.464 billion for the TRANs and \$7.450 billion for the estimated

¹⁴Board of Governors of the Federal Reserve System, Municipal Liquidity Facility Term Sheet, FAQs: Appendix A. Last accessed on September 30, 2020 at https:// www.newyorkfed.org/medialibrary/media/markets/municipal-liquidity-facility-eligible-issuers.

¹⁵For details, see the Official Statement. Last accessed on September 20, 2020 at Electronic Municipal Market Access (EMMA) https://emma.msrb.org/P11405666-P11092584-P11501248.pdf.

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Sources of funds	Market TRAN notes, USD	Municipal liquidity facility notes, USD	Difference, USD
Par amount	7,200,000,000	7,450,713,984	-250,713,984
Bond premium	264,863,270	0	264,863,270
Total sources	7,464,863,270	7,450,713,984	14,149,286
Uses of funds			
Project funds	7,443,063,270	7,443,063,270	0
Cost of issuance	200,000	200,000	0
Underwriter discount	21,600,000	0	21,600,000
Origination fee	0	7,450,714	-7,450,714
Additional proceeds	0	0	0
Total uses	7,464,863,270	7,450,713,984	14,149,286
			0
Results			0
Total interest	282,476,712	76,951,382	205,525,330
Total debt service	7,482,476,712	7,527,665,366	-45,188,654
Dated/delivery	2-Sep-20	2-Sep-20	
Coupon	4.000%	1.053%	2.947%
Yield	0.240%	1.053%	-0.813%
Final maturity	26-Aug-21	26-Aug-21	
True interest cost	0.538%	1.153%	-0.615%

TABLE A1	Notional example for the	e MLF versus municipal	market borrowing
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Abbreviation: MLF, Municipal Liquidity Facility.

Source: Thomspson Reuters, Bloomberg, and Electronic Municipal Market Access (EMMA: website https://emma.msrb.org/P11405666-P11092584-P11501248.pdf).

MLF note, with the \$14.149 million difference attributable to the higher underwriter fees on the TRANs (\$21.6 million) relative to the cost of the Fed's origination fee (\$7.45 million).

Table A1 details the results of the financing comparison for the actual 1-year TRANs and estimated MLF note financing. The true interest cost on the actual market TRANs is 0.538% and 1.153% for the estimated MLF note. This represents a 0.615 percentage point borrowing cost premium for the notional MLF note over the TRANs, which would have resulted in \$45.2 million in additional debt service costs.

APPENDIX B: WERE CREDIT RATING SPREADS TOO HIGH?

A separate issue regarding interest rates provided by the MLF is the basis point spreads across the rating spectrum. The spreads established by the Federal Reserve are shown in Table B1. When the Fed lowered the OIS-AAA/Aaa spread by 50 basis points, it did not revise the credit rating spreads across municipal ratings. Table B1 shows that spreads on investment grade bonds range from a low of five basis points to a high of 60. The median investment grade

TABLE B1 Comparison of credit ra	ating spreads (b	asis points), year	s 2011–2019					28
	ä	anel A: All eligi	ble issuers					Ц
Credit ratings		ILF spread	Average spre	ad MLF m	inus average			Publi
AAA/Aaa to AA+/Aa1		20	1.52	18.48				CBU &I
AA+/Aa1 to AA/Aa2		5	2.36	2.64				dgeti Finan
AA/Aa2 to AA–/Aa3	·	15	5.24	9.76				NG ICE
AA-/Aa3 to A+/A1	_,	50	3.09	46.91				
A+/A1 to A/A2	·	10	4.80	5.20				
A/A2 to A-/A3	·	15	15.51	-0.51				
A-/A3 to BBB+/Baa1	÷	50	25.76	34.24				
BBB+/Baa1 to BBB/Baa2	·	15	8.86	6.14				
BBB/Baa2 to BBB-/Baa3		40	18.41	21.59				
BBB-/Baa3 to Below Investment Grace	de 2	10	53.00	157.00				
	Panel B: Eligi	ible issuers by g	government type					
		States		Counties		Cities		
Credit ratings	MLF spread	Average spread	MLF minus Average	Average spread	MLF minus Average	Average spread	MLF minus Average	
AAA/Aaa to AA+/Aa1	20	0.38	19.62	3.22	16.78	0.96	19.04	
AA+/Aa1 to AA/Aa2	5	3.78	1.22	3.73	1.27	1.98	3.02	
AA/Aa2 to AA–/Aa3	15	3.14	11.86	4.00	11.00	6.09	8.91	
AA-/Aa3 to A+/A1	50	-0.95	50.95	4.25	45.75	3.71	46.29	
A+/A1 to A/A2	10	8.56	1.44	4.62	5.38	3.72	6.28	
A/A2 to A-/A3	15	14.90	0.10	18.48	-3.48	14.15	0.85	J
A-/A3 to BBB+/Baa1	60	29.08	30.92	31.57	28.43	19.17	40.83	OHNS

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	Panel B: Elig	ible issuers by	r government type				
		States		Counties		Cities	
Credit ratings	MLF spread	Average spread	MLF minus Average	Average spread	MLF minus Average	Average spread	MLF minus Average
BBB+/Baa1 to BBB/Baa2	15	7.05	7.95	3.77	11.23	12.45	2.55
BBB/Baa2 to BBB–/Baa3	40	14.26	25.74	17.89	22.11	23.99	16.01
BBB-/Baa3 to Below Investment Grade	210	44.27	165.73	59.20	150.80	59.66	150.34
			•		•		

Source: Data are from Ipreo Municipal Application and the Federal Reserve. Issuers are issuers of tax-exempt, non-insured securities of three or fewer years.

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spread is 15 basis points, but several high-quality ratings have higher spreads. The AAA/Aaa to AA+/Aa1 spread is 20 basis points and the AA-/Aa3 to A+/A1 spread is 50.

MLF guidance covers issuer credit rating requirements and other considerations regarding credit quality but does not disclose the reasoning behind the credit spreads.¹⁶ For example, the requirement is that each issuer must have a long-term credit rating of BBB–/Baa3 or above from two or more credit rating firms. It also describes what happens when issuers are downgraded and how the average rating will be determined if split ratings are observed. But there is no disclosure of how interest rate spreads across credit ratings were determined. Thus, a basic question arises: Were the MLF interest rates across credit ratings consistent with historical credit spreads in the market?

To answer this question, we analyze historical credit rating spreads for a sample of municipal securities. Our sample consists of 139,652 state and local securities sold by MLF-eligible type issuers from 2008 to 2010 and 2011 to 2019. We consider the 2011 to 2019 period to be a time of typical activity in the municipal securities market and the 2008 to 2010 period to be a crisis period, since this was the time when municipal interest rates, particularly short-term rates, were significantly affected by the financial crisis during the Great Recession. The securities in our sample are tax-exempt, non-insured, and have a maximum term-to-maturity of 3 years. For additional analysis, we also separate the sample into each borrower eligibility type: state, county, and city.

Table B2 shows whether the historical annual credit rating spread is on average above or below the MLF interest rate for state and local securities. Panel A shows the ratings, the MLF spread and the historical spread for all eligible issuers (AEI) from 2011 to 2019. Notice that the MLF spread is much higher than the historical spread for all ranges except A/A2 to A–/A3 (see the column labeled "MLF minus Average"). The difference is greatest for AA–/Aa3 to A–/A1 bonds at 47 basis points, and it is also very large for AAA/Aaa to AA+/Aa1, A–/A3 to BBB+/Baa1, and BBB-/Baa3 to Below Investment Grade ratings. There is a huge leap in MLF basis points from AA–/Aa3 to A+/A1, and from A-/A3 to BBB+/Baa1. Also, the spread from AAA/Aaa to AA+/Aa1 is very large for such highlyrated bonds. Overall, MLF spreads are very high compared to historical spreads.

Panel B of Table B2 shows the spreads broken down by state, county, and city. The state-only spreads are similar to the AEI spreads. They are higher across the rating spectrum, and markedly high except for the A/A2 to A–/A3 spread, which is negligible. County historical spreads are also lower except in the A/A2 to A–/A3 range. City historical spreads are uniformly lower. Spreads across states, counties, and cities vary substantially. For some, rating spreads are close, but Panel B shows that historical spreads in the municipal securities market vary substantially by level of government.

Table B2 shows rating spreads from 2008 to 2010, the financial crisis and Great Recession period. Comparing MLF and historical credit spreads during the Great Recession shows a somewhat different picture compared to the 2011 to 2019 period. In four out of nine investment grade rating spread categories, the MLF spread is less than the 2008 to 2010 average spread for states, counties, and cities. The benefit from the MLF ranges from a high of 29 basis points in the BBB/Baa2 to BBB –/Baa3 range to a low of two basis points in the AA+/Aa1 to AA/Aa2 range. In five investment grade rating categories, however, the MLF spread is still higher than the average AEI spread.

The pattern is similar for states only, but there is an even greater benefit from the facility for states in the AA+/Aa1 to AA/Aa2 range. The overall pattern is similar for counties and cities, with counties receiving slightly more benefit, and cities receiving somewhat less benefit from the facility than all eligible issuers. Overall, the MLF interest rate spreads across the rating spectrum—and across levels of government—provide more benefit when rates are compared to those during the 2008 to 2010 financial crisis.

¹⁶Board of Governors of the Federal Reserve System, Municipal Liquidity Facility Term Sheet, FAQs. Effective May 11, 2020.

TABLE B2 Comparison of credit ra	ting spreads (b	asis points), years 2	2008–2010				
	Pa	inel A: All eligible	issuers				
Credit ratings	W	LF spread	Average spread	MLF mir	us Average		
AAA/Aaa to AA+/Aa1	2	0	6.79	10.21			
AA+/Aa1 to AA/Aa2		5	7.36	-2.36			
AA/Aa2 to AA-/Aa3	1	5	7.38	7.62			
AA-/Aa3 to A+/A1	ĿŊ	0	23.50	26.50			
A+/A1 to A/A2	1	0	22.62	-12.62			
A/A2 to A-/A3	-	5	13.24	1.76			
A-/A3 to BBB+/Baa1	Q	Q	36.86	23.14			
BBB+/Baa1 to BBB/Baa2	1	5	31.42	-16.42			
BBB/Baa2 to BBB–/Baa3	ч	Q	69.97	-29.97			
BBB-/Baa3 to Below Investment Grad	e 21	0	-25.58	235.58			
	Panel B: Elig	ible Issuers by Go	vernment Type				
		States		Counties		Cities	
Credit ratings	MLF spread	Average spread	MLF minus average	Average spread	MLF minus Average	Average spread	MLF minus Average
AAA/Aaa to AA+/Aa1	. 50	17.47	2.53	7.59	12.41	9.19	10.81
AA+/Aa1 to AA/Aa2	S	23.99	-18.99	1.14	3.86	3.12	1.88
AA/Aa2 to AA–/Aa3	15	-2.51	17.51	15.71	-0.71	11.13	3.87
AA-/Aa3 to A+/A1	50	36.34	13.66	23.53	26.47	16.00	34.00
A+/A1 to A/A2	10	21.31	-11.31	23.30	-13.30	21.95	-11.95
A/A2 to A–/A3	15	-5.70	20.70	2.76	12.24	25.17	-10.17
A–/A3 to BBB+/Baa1	60	20.45	39.55	54.25	5.75	35.69	24.31
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	Panel B: Elig	ible Issuers by Go	vernment Type				
		States		Counties		Cities	
: :	-	-	MLF minus	-		-	
Credit ratings	MLF spread	Average spread	average	Average spread	MLF minus Average	Average spread	MLF minus Average
BBB+/Baa1 to BBB/Baa2	15	27.42	-12.42	33.97	-18.97	30.36	-15.36
BBB/Baa2 to BBB-/Baa3	40	72.74	-32.74	87.53	-47.53	13.96	26.04
BBB–/Baa3 to Below Investment Grade	210	-23.32	233.32	-156.45	366.45	40.31	169.69

Source: Data are from Ipreo Municipal Application and the Federal Reserve. Issuers are issuers of tax-exempt, non-insured securities of three or fewer years.