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**TOWARDS AN ENHANCED LENDER OF
LAST RESORT AND MARKET MAKER
OF LAST RESORT**

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TOWARDS AN ENHANCED LENDER OF LAST RESORT AND MARKET MAKER OF LAST RESORT

Abstract

The Great Financial Crisis of 2007-2009, the European sovereign debt crisis and the financial turmoil associated with the Covid-19 pandemic help make a compelling case for two significant changes in the central banks' design and implementation of their financial stability role. First, enhance the scale and scope of the existing lender of last resort (LOLR) mechanism by (1) extending the range of eligible counterparties and (2) extending the range of eligible instruments at the discount facility/ies. Second, create a proper market maker of last resort (MMLR) to engage in outright purchases of a range of financial instruments with a wide (in principle unrestricted provided delivery is assured) range of counterparties. Section 2 describes the market failures – culminating in funding liquidity crises and market liquidity crises – that create the need for an enhanced LOLR and an MMLR. Section 3 looks at the quite impressive amount of enhanced LOLR and MMLR experimentation engaged in since late 2007 by the Federal Reserve, the European Central Bank and the Bank of England. Section 4 discusses the principal issues in the design of an effective enhanced LOLR and MMLR. A key design issue involves ensuring that their creation does not cause new market failures, especially moral hazard-driven excessive risk-taking by counterparties and issuers of securities. To minimize moral hazard, both the enhanced LOLR and the MMLR should operate on penalty terms.

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Towards an enhanced lender of last resort and a market maker of last resort

Willem H. Buiter

2023 -01-30

Abstract

The Great Financial Crisis of 2007-2009, the European sovereign debt crisis and the financial turmoil associated with the Covid-19 pandemic help make a compelling case for two significant changes in the central banks' design and implementation of their financial stability role. First, enhance the scale and scope of the existing lender of last resort (LOLR) mechanism by (1) extending the range of eligible counterparties and (2) extending the range of eligible instruments at the discount facility/ies. Second, create a proper market maker of last resort (MMLR) to engage in outright purchases of a range of financial instruments with a wide (in principle unrestricted provided delivery is assured) range of counterparties.

Section 2 describes the market failures – culminating in funding liquidity crises and market liquidity crises – that create the need for an enhanced LOLR and an MMLR.

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Section 4 discusses the principal issues in the design of an effective enhanced LOLR and MMLR. A key design issue involves ensuring that their creation does not cause new market failures, especially moral hazard-driven excessive risk-taking by counterparties and issuers of securities. To minimize moral hazard, both the enhanced LOLR and the MMLR should operate on penalty terms.

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1. Introduction: the two changes required in the current lender of last resort mechanism

In this paper I argue that the Great Financial Crisis (GFC), the European sovereign debt crisis and the financial turmoil associated with the Covid-19 pandemic help make a compelling case for two significant changes in the central banks' design and implementation of their financial stability role. First, enhance the scale and scope of the existing lender of last resort (LOLR) mechanism by (1) extending the range of eligible counterparties and (2) extending the range of eligible instruments at the discount facility/ies. Second, create a proper market maker of last resort (MMLR) to engage in outright purchases of a range of financial instruments with a wide (I would argue in principle unrestricted provided delivery is assured) range of counterparties. An early statement of this perspective can be found in Buiter (2007) and Buiter and Sibert (2007); see also Tucker (2009).¹

Section 2 describes the market failures – culminating in funding liquidity crises and market liquidity crises - that create the need for an enhanced LOLR and an MMLR. Starting from the existing commercial bank focused LOLR mechanism, the growing diversity and complexity of commercial bank financial operations call for enhanced LOLR operations to address contemporary funding liquidity crises. At the same time, the growing scale and complexity of non-bank financial intermediation call both for LOLR access for non-bank financial institutions (NBFIs) and for the creation of an effective MMLR to address market liquidity issues that could have systemic consequences – notably fire sales of financial instruments that have become illiquid.

Section 3 looks at the quite impressive amount of enhanced LOLR and MMLR experimentation engaged in since late 2007 by the Federal Reserve (Fed), the European Central Bank (ECB) and the Bank of England (BoE).

Section 4 discusses the principal issues in the design of an effective enhanced LOLR and MMLR. A key design issue involves ensuring that the creation of an enhanced LOLR and MMLR does not cause new market failures, especially moral hazard-driven excessive risk-taking by counterparties and issuers of securities.

Some important measures to boost financial stability will not be discussed in what follows. The main ones are some of the [macroprudential policy actions](#) taken during 2020 by national central banks (NCBs) (including the Fed, the (then) 19 euro area NCBs and the BoE) in response to the coronavirus outbreak, such as releasing or reducing capital buffers. While significant, they cannot be viewed as enhanced LOLR/MMLR policies. They boost the resources available for absorbing losses and supporting lending and asset purchases, but they do not directly impact collateral standards, or counterparty eligibility for collateralized transactions. Nor do they directly affect the eligibility of securities and counterparties for outright purchases of financial instruments.

¹ The market maker of last resort has been given other names in the literature. Mehrling (2011, 2014) uses the term “dealer of last resort”. Snower (2008) uses the term “buyer of last resort” in a slightly different sense – the prevention of potential insolvencies through Treasury Departments and ministries of finance buying preferred shares or warrants in troubled financial institutions. Forbes (2009) uses “buyer of last resort” in the sense of MMLR.

2. From commercial bank-focused LOLR to enhanced LLOR and MMLR

2.1. The traditional LOLR mechanism.

A lender of last resort engages in bilateral collateralized loans with selected counterparties. Both the often temporarily illiquid assets accepted as collateral and the counterparties are, in principle and in practice, restricted. A market maker of last resort engages in outright purchases with counterparties of often temporarily illiquid assets. Here too the assets purchased, and the counterparties are, in principle, restricted, although in what follows I shall argue in favor of effectively unrestricted counterparties for outright secondary market transactions.

When banks were the main providers of credit, the financial stability mandate of central banks could be summarized as their narrow LOLR function: in times of crisis, lend freely, at a penalty rate and against collateral that would be good in normal times but may be impaired (illiquid) in times of crisis (see Bagehot (1873))². The counterparties of the central bank in these LOLR operations were commercial banks broadly defined - deposit-taking institutions whose main liabilities were deposits withdrawable on demand and subject to a sequential service (first-come, first served) constraint. The main assets of these commercial banks were illiquid loans.

This financial structure invited bank runs when confidence in the banks was undermined, for whatever reason - including purely self-fulfilling expectations. This is the world described in Diamond and Dybvig (1983).

When banks were the dominant intermediaries, a narrow LOLR that targeted banks was the right vehicle for dealing with runs, funding liquidity crises and credit squeezes. The central bank (the inevitable choice for the institution(s) implementing the LOLR role) stood ready to engage in bilateral collateralized transactions with banks, at the discretion of the banks, typically at any time and on any scale, but on penalty terms.

The principal drawback of the LOLR mechanism was the risk of moral hazard: knowing that collateralized funding will always be available as long as eligible collateral can be provided may encourage excessive risk taking by the private counterparties of the LOLR. This risk is reduced (it can never be completely eliminated) by making the crisis funding available only on penalty terms. This can be implemented in a variety of ways, including charging a penalty interest rate on the loan and/or imposing “haircuts” on the collateral that is provided.

Note that central banks acting as LOLR must face the challenge of setting the terms and conditions for the emergency credit they provide (including the penalties) without the benefit of orderly market prices acting as a guide. The central banks must be able to model (bank) asset pricing in disorderly markets – a daunting challenge, but an inescapable one if the central bank is to discharge its financial stability

² “As we have seen, principle requires that such advances, if made at all for the purpose of curing panic, should be made in the manner most likely to cure that panic. And for this purpose, they should be made on everything which in common times is good ‘banking security’. The evil is, that owing to terror, what is commonly good security has ceased to be so; and the true policy is so to use the Banking reserve, that, if possible, the temporary evil may be stayed, and the common course of business be restored. And this can only be effected by advancing on all good Banking securities”. Bagehot (1873, pp 204-205).

responsibilities effectively. Note that some central banks accept even non-marketable assets as collateral (the ECB is an example). Valuing non-marketable assets is a daunting task indeed. Part of this challenge involves distinguishing between counterparties that are illiquid but solvent and therefore should be funded and counterparties that are illiquid because they are insolvent (and would be insolvent even if funding markets were liquid) and therefore should be restructured and, if necessary, liquidated in an orderly manner.

2.2. Non-bank financial intermediation, funding liquidity crises, market liquidity crises and perverse interactions between the two.

With the increasing diversity and complexity of intermediation through banks, and the growing role of non-bank financial intermediation, the financial stability role of central banks must be augmented in two ways.

First, the LOLR role has to be expanded both by increasing the range of financial instruments that can be discounted (offered as collateral at the discount window(s) and other standing facilities) and by increasing the range of eligible counterparties at the discount window(s).³ This raises the question as to whether these discount operations should include financial instruments that may be illiquid even when financial markets are orderly. The key requirement is that it is possible for the central bank to value the collateral – both when markets are disorderly and when they are orderly. Can central banks value collateral that is illiquid even in normal times? I believe the answer to this question is likely to be ‘no’ and would therefore restrict the collateral to financial instruments (and possibly real assets) that are liquid when markets are orderly. Another open question is how wide the range of eligible counterparties should be. It will clearly have to include some non-bank financial institutions (and foreign and international financial institutions) - but how many? And could it possibly include non-financial corporates?

For LOLR operations, even enhanced ones, counterparties must remain restricted, because, along with the quality of the collateral, the creditworthiness of the counterparties is a key driver of the financial risk assumed by the central bank in these collateralized loans (I assume that all discount window loans and indeed all LOLR collateralized loans are recourse loans). Does this mean that only entities supervised and regulated by the central bank should be eligible counterparties? I would impose this requirement only if there can be a material expansion in the range of financial entities that are regulated by the central bank. If we impose this requirement, a wider range of NBFIs would likely be regulated by the central bank (possibly in cooperation with any existing regulators), so as to become eligible counterparties at the central bank’s discount window(s) and other LOLR lending facilities. But this would likely still exclude non-financial corporates as LOLR counterparties, as I cannot envisage the central bank regulating non-financial entities. As I do believe some non-financial corporates should be eligible LOLR counterparties, I do not favor restricting eligible counterparties to entities formally supervised and regulated by the central bank. The central bank must be able to assess the solvency of any eligible counterparty.

³ The importance of central banks’ collateral frameworks has been emphasized in Nyborg (2017) and Pellizon et. al. (2020).

Second, the central bank has to function as MMLR for a (potentially wide) range of systemically important financial instruments, engaging in outright purchases of these assets with a (potentially very wide or even unrestricted) range of counterparties (see e.g., Hauser (2021)). Such open market operations would include financial instruments that have become illiquid, although, as noted earlier, I would restrict eligible financial instruments to securities and other assets that are liquid when markets are orderly. The range of counterparties should include banks and NBFIs (including foreign banks and international financial institutions), non-financial corporates and possibly households (see e.g., Czech et al. 2021) and Financial Stability Board (2020)).

A case can be made that, once the list of financial instruments eligible for MMLR operations has been specified, counterparties should be essentially unrestricted. The prices received and paid (and any penalties, including haircuts) should depend on the fundamental valuation of the eligible securities by the central bank and not on the identity of the buyer or seller of the financial instruments.

In other words, an MMLR is an entity (I believe it should be a government entity (in practice the central bank)) that ensures that there is a buyer for every seller at reasonable and fair prices in a set of systemically important securities markets. “Reasonable and fair” here means characterized by a proper, moral-hazard-optimizing penalty relative to the fundamental price that would prevail if markets were liquid.

The reason we need an MMLR is that markets for the outright sale of financial instruments can become illiquid (suffer from market illiquidity) for non-fundamental, self-fulfilling prophecy reasons (see e.g., Buiter (2007), Buiter and Sibert (2007) and Cecchetti and Disyatat (2010)). The reasons markets become illiquid are not fundamentally different from the reasons why lending and borrowing (collateralized and non-collateralized) can become illiquid (suffer from funding illiquidity), which calls for an LOLR when the lending and borrowing in question are deemed systemically important. When markets threaten to become illiquid, fire sales of financial instruments can drive asset prices down to levels so low that the markets disappear. Defaults, insolvencies, and bankruptcies of fundamentally viable corporates can be the result. Full-blown financial crises may occur if the disorderly and illiquid financial market conditions persist. Even the world’s most liquid securities markets – those for US Treasury securities – at times became disorderly during the Covid pandemic and necessitated Fed interventions both through repos and through outright purchases (see Duffie (2020), Liang and Parkinson (2020), Fleming and Keane (2021), Fleming and Ruela (2020), Logan (2020) and Vissing-Jørgenson (2021)). Becker and Benmelech (2021) show that U.S. corporate bond markets proved quite resilient against a sharp contraction caused by the 2020 Covid-19 pandemic, but also that Fed interventions boosted bond issuance (and to a lesser degree syndicated bank loan issuance) during the critical pandemic episode (see also Liang (2020)). I doubt whether we would have witnessed the same degree of corporate bond market resilience without the Fed’s interventions.

Excessive market volatility may be an indicator and predictor of incipient illiquidity. Without interfering with normal (“healthy”) market volatility, the MMLR should take excessive and extreme volatility as a likely precursor of market failure through illiquidity and should undertake appropriate purchases (and sales, if required) to dampen such chaotic market behavior.

Up to a point, private vulture funds may be able to provide the MMLR services needed to restore order in illiquid financial markets by buying at prices that, although distressed, are not financially ruinous for the selling party. The issue is one of scale or scope. There may be no private vulture fund in the market

segment where the illiquidity occurs, and fire sales threaten. Or the scale of interventions required is beyond the capacity of private vulture funds to manage. Past crises demonstrate that private vulture funds are insufficient. Public vulture funds, that is LLORs and MMLRs, are required.

During the GFC, the Eurozone sovereign debt crisis and the Covid-19 pandemic, we have frequently seen the central banks engage simultaneously in enhanced LOLR and MMLR operations. This should come as no surprise, as funding illiquidity and market illiquidity often interact in perverse, mutually amplifying ways.

A bank facing problems selling assets that have become illiquid (a market illiquidity problem) may try to address the resulting financial shortfall by attempting to increase its borrowing or reduce its lending, thus triggering potential stresses in its funding markets and creating a funding liquidity problem for itself or for others. Likewise, a bank facing unexpected constraints on its ability to borrow (a funding liquidity problem) may end up having to sell assets to make up the financial shortfall, which could turn into fire sales and a full-blown market illiquidity problem. And similar configurations of market illiquidity and funding illiquidity can affect NBFIs and indeed non-financial corporations with significant balance sheets.

3. Some examples of enhanced LLOR and MMLR interventions since the GFC

Before we consider the optimal design of an enhanced LLOR and MMLR, it is instructive to look at some recent examples of enhanced LLOR and MMLR interventions by central banks, often supported by the fiscal authorities. These interventions have been widespread, including in emerging market economies (EMEs) (see e.g., Cavallino and De Fiore (2020), Arslan, Drehmann and Hoffman (2020) and Bank for International Settlements (2014), and we will be very selective in our presentation, confining ourselves to the US, the euro area and the UK.

3.1. The Fed

The Fed's enhanced LOLR and MMLR activities during the GFC

Enhanced LORL measures

Right from the start of the GFC there were modifications of the traditional discount window, which only engages in collateralized lending to depository institutions. The Fed lowered, as early as 17 August 2007, the spread between the primary credit rate and the target federal funds rate. Such reductions in the penalty element of the cost of access to this LOLR facility helps the borrowing banks but inevitably also increases the moral hazard involved in its use. There were experiments with at least eight other enhanced LOLR facilities.

Primary credit. On August 17, 2007, the Fed allowed the provision of primary credit for up to 30 days – the previous norm had been overnight. This was raised to 90 days on March 16, 2008. Since March 18, 2010, the typical maximum maturity on primary credit is overnight again.

Term Auction Facility (TAF). This facility was created on December 12, 2007, to improve depository institutions' access to term funding. It offered 28-day and, starting August 2008, 84-day loans, fully

collateralized, with a haircut applied to the value of the collateral, through an auction mechanism. The final TAF auction was held on March 8, 2010.

Primary Dealer Credit Facility (PDCF). This facility, created on March 16, 2008, provided fully collateralized overnight loans (with appropriate haircuts) to primary dealers. The PDCF was closed on February 1, 2010. In the U.S., a primary dealer is a bank or securities broker-dealer that can trade directly with the Fed. The PDCF effectively extended the discount window to primary dealers – an enlargement of the set of eligible counterparties.

Term Securities Lending Facility (TSLF). Also in March 2008, the TSLF was created to loan Treasury securities for a fee to primary dealers for one month against eligible collateral consisting of other, less liquid securities. The TSLF was closed on February 1, 2010.

Term Securities Lending Options Program (TOP). Created at the same time as the TSLF, this offered an option to primary dealers to draw upon short-term, fixed-rate TSLF loans from the System Open Market Account portfolio in exchange for eligible collateral on a specified future date. The options were awarded through a competitive auction. It was closed on February 1, 2010.

Term Asset-Backed Securities Loan Facility (TALF). This was a funding facility, created in November 2008, under which the Federal Reserve Bank of New York (FRBNY) issued nonrecourse loans with terms of up to five years to holders of eligible asset-backed securities (ABS). TALF loans are fully collateralized by the ABS purchased by the TALF borrower. It closed for new loans on June 30, 2010.

Bilateral dollar liquidity swap arrangements with several foreign central banks. In December 2007, the Fed authorized dollar liquidity swap lines with the ECB and the Swiss National Bank (SNB), subsequently extended to an additional twelve central banks: the Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Canada (BoC), Danmarks Nationalbank, the BoE, the Bank of Japan (BoJ), the Bank of Korea, the Banco de Mexico, the Reserve Bank of New Zealand, Norges Bank, the Monetary Authority of Singapore and Sveriges Riksbank. These arrangements terminated on February 1, 2010. In May 2010 dollar liquidity swap lines were re-established between the Fed and the BoC, the BoE, the ECB, the BoJ and the SNB.

Foreign-currency liquidity swap lines. In April 2009, the Fed created foreign-currency liquidity swap lines with the BoE, the ECB, the BoJ and the SNB. These arrangements terminated on February 1, 2010. In November 2011, the Fed arranged temporary foreign-currency liquidity swap lines with the BoC, the BoE, the BoJ, the ECB, and the SNB.

In October 2013, these six central banks (Fed, BoC, BoE, BoJ, ECB and SNB) agreed that their existing temporary liquidity swap arrangements, including the dollar liquidity swap lines and the foreign-currency liquidity swap lines, would be converted into open-ended standing arrangements.

These instances of international LOLR arrangements were (and are) of vital importance to the global economy given the U.S. dollar's status as the world's leading reserve currency.

Note that except for some of the international LOLR arrangements, all these enhanced LOLR facilities were strictly temporary.

MMLR measures

Commercial Paper Funding Facility (CPFF). This was a facility, created in October 2008 that provided a liquidity backstop to U.S. issuers of commercial paper through a specially created limited liability company (LLC). The LLC purchased three-month unsecured and asset-backed commercial paper directly from eligible issuers. It was closed on February 1, 2010. This is indirect MMLR or MMLR “once removed”. Instead of purchasing the commercial paper outright itself, the Fed created a special purpose vehicle to engage in the purchases (and sales). Effectively, the Fed created a publicly owned vulture fund to purchase illiquid commercial paper.

Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF). This lending facility was announced in September 2008 to finance the purchases of high-quality asset-backed commercial paper (ABCP) from money market mutual funds by U.S. depository institutions and bank holding companies. It was closed on February 1, 2010. This again is indirect MMLR or MMLR “once removed”.

Money Market Investor Funding Facility (MMIFF). This facility was announced in October 2008, but no loans were made under it, and it expired on October 30, 2009. Under the MMIFF, the FRBNY could provide senior secured funding to a series of SPVs - LLCs that were established with the private sector. This would finance the purchase of eligible assets from eligible investors by these LLCs. Eligible assets included U.S. dollar-denominated certificates of deposit, bank notes and commercial paper issued by highly rated financial institutions. This again is indirect MMLR or MMLR “once removed”.

Note that all MMLR arrangements were strictly temporary.

I would not include the Fed’s purchases of agency-guaranteed mortgage-backed securities (MBS) (started in September 2012 at \$40 billion per month) and of longer-term Treasury securities (started in January 2013 at a pace of \$45 billion per month) in the enhanced LOLR and MMLR operations of the Fed. This is the new conventional monetary policy at the ELB. The purchases concluded in October 2014.

Support for specific institutions (mostly Bear Stearns and the American International Group) represents fiscal bailouts conducted (inappropriately in my view) via the monetary authority. I would not include it under enhanced LOLR and MMLR operations.

The Fed’s enhanced LOLR and MMLR activities during the Covid-19 pandemic.

As part of its response to the Covid-19 crisis, the Fed engaged in large-scale purchases of U.S. Treasuries and agency MBS and created or resurrected ten domestic facilities in 2020. Five of these were enhanced LOLR facilities; five of these were MMLR facilities that enabled and promoted the outright purchases of risky securities. In addition to these domestic facilities, the Fed also initiated two international LOLR facilities, the U.S. dollar liquidity swap lines and the FIMA Repo Facility.

Enhanced LOLR measures

Primary Dealer Credit Facility (PDCF). On March 17, 2020, this facility was (re)created to provide financing to the Fed’s 24 primary dealers collateralized by a wide range of investment grade securities. Unlike the PDCF that operated between 2008 and 2010, which provided only overnight loans, the new facility offered term funding for up to 90 days. It expired on March 31, 2021.

Money Market Mutual Fund Liquidity Facility (MMLF). This was created on March 18, 2020, to provide loans to depository institutions secured by assets purchased from prime money market funds (covering highly rated asset backed commercial paper and municipal debt). It ceased extending credit on March 31, 2021.

Term Asset-Backed Securities Loan Facility (TALF). On March 23, 2020, this facility was (re)created to promote the issuance of asset-backed securities backed by student loans, car loans, credit-card loans, loans guaranteed by the Small Business Administration, and certain other assets. The TALF ceased extending credit on December 31, 2020. The US Treasury, using the Exchange Stabilization Fund (ESF), made a \$10 billion equity investment in the SPV established by the Fed for this facility.

Paycheck Protection Program Liquidity Facility (PPPLF). On April 9, 2020, this facility was created to provide liquidity to financial institutions that originated loans under the Small Business Administration's Paycheck Protection Program (PPP), taking the loans as collateral at face value. The expiration date for the PPPLF was extended to July 30, 2021.

Domestic standing repo facility (SRF). On 28 July 2021, the Fed created a domestic standing repo facility, Under the SRF the Fed conducts daily overnight operations against Treasury securities, agency debt securities and agency MBS. Counterparties are primary dealers and SRF counterparties, which include depository institutions. Its purpose was to serve, together with the repo facility for foreign and international monetary authorities (FIMA Repo Facility, discussed below), as backstops in money markets to support the effective implementation of monetary policy and smooth market functioning.

U.S. dollar liquidity swap lines. On March 19, 2020, the Fed announced the establishment of temporary U.S. dollar liquidity arrangements (swap lines) with nine foreign central banks. These swap lines allow the provision of U.S. dollar liquidity up to \$60 billion each for the Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Korea, the Banco de Mexico, the Monetary Authority of Singapore, and the Sveriges Riksbank (Sweden). They allow the provision of U.S. dollar liquidity up to \$30 billion each for the Danmarks Nationalbank (Denmark), the Norges Bank (Norway), and the Reserve Bank of New Zealand. The swap lines were extended through September 30, 2021.

Foreign and International Monetary Authorities Repurchase Agreement Facility (FIMA Repo Facility).

On March 31, 2020, the Fed announced the establishment of a temporary repurchase agreement facility for foreign and international monetary authorities – the FIMA Repo Facility. It allows FIMA account holders to enter into repurchase agreements with the Fed. They temporarily exchange their U.S. Treasury securities held with the Fed for U.S. dollars, which can then be made available to institutions in their jurisdictions. This alternative to outright sales of U.S. Treasury securities can help maintain orderly markets. This facility was made a standing facility on July 28, 2021.

Note that all these enhanced LLOR facilities, except for the SRF and FIMA, were strictly temporary.

MMLR measures

According to Fleming and Ruela (2020), between March 15 and March 31, 2020, the Fed purchased \$775 billion in Treasury securities (and \$291 billion in agency MBS). A similar figure can be found in Duffie (2020), who states that the Fed purchased \$1 trillion of Treasuries in the three-week period from March

16, 2020, and then continued to buy at a high rate, while also relaxing the Supplementary Leverage Ratio rule for reserves and Treasuries. Garbade and Keane (2020) report cumulative Fed purchases between March 13 and July 31, 2020, amounting to \$1.77 trillion of Treasuries and \$892 billion of agency MBS. Duffie calls for a broad central clearing mandate for U.S. Treasuries to prevent a recurrence of the kind of disorder that prompted these purchases.

Commercial Paper Funding Facility (CPFF). On March 17, 2020, the Fed (re)created this facility to facilitate the issuance of commercial paper by companies and municipal issuers. This involved the creation of an SPV that purchases unsecured and asset-backed commercial paper rated A1/P1 directly from eligible companies. It ceased purchasing commercial paper on March 31, 2021. The US Treasury, using the Exchange Stabilization Fund made a \$10 billion equity investment in the SPV.

Secondary Market Corporate Credit Facility (SMCCF). On Monday, March 23, 2020, for the first time in its history, the Fed, together with the Department of the Treasury, created a facility to directly purchase investment-grade corporate bonds of U.S. companies (and ETFs that invested in corporate bonds) in the secondary markets, through an SPV. The size and scope of the SMCCF and the PMCCF were expanded on April 9, 2020. It ceased purchasing eligible assets on December 31, 2020. The US Treasury made a \$75 billion equity investment in the SPV to support both the SMCCF and the Primary Market Corporate Credit Facility. See also Gilchrist et. al. (2020).

Primary Market Corporate Credit Facility (PMCCF). At the same time it created the SMCCF, the Fed created the PMCCF to purchase newly issued bonds directly from corporate issuers, through an SPV. It ceased purchasing eligible assets on December 31, 2020.

Municipal Liquidity Facility (MLF). On April 9th, 2020, the Fed created the MLF to purchase short term notes directly from state and eligible local governments, through an SPV. It ceased purchasing eligible notes on December 31, 2020. The US Treasury, using funds from the Exchange Stabilization Fund, made an initial equity investment of \$35 billion in the SPV.

Main Street Lending Program (MSLP). On April 9, 2020, the MSLP was created to support lending to small and mid-sized businesses. It involved the creation of a SPV to purchase participations in loans originated by eligible lenders. It ceased purchasing participations in eligible loans on January 8, 2021. The US Treasury, using funds from the Exchange Stabilization Fund, made a \$75 billion equity investment in the SPV.

The Fed has also bought exchange traded funds (ETFs), specifically shares of bond funds, through the Secondary Market Corporate Credit Facility. It announced this March 2020 and began purchasing exchange-traded corporate bond funds on May 12, 2020. At the end of 2020 the Fed, through the SMCCF, had bought [\\$8.6 billion](#) worth of bond ETFs out of a total of [\\$14.2 billion](#) in eligible securities bought by the SMCCF.

3.2. The ECB

The ECB's enhanced LOLR and MMLR activities during the GFC and the European sovereign crises.

The ECB engaged in enhanced LOLR and MMLR activities during the European sovereign debt crisis. (see Acharya, Pierret and Steffen (2020)).

Enhanced LOLR measures

Long-term refinancing operations (LTROs). As regards enhanced LOLR operations, the LTROs introduced in two stages in December 2011 and March 2012, qualify. The ECB provided long-term liquidity directly to banks against eligible collateral without imposing any conditionality after Eurozone banks lost much of their unsecured funding from U.S. money market funds (MMFs) in 2011. The LTRO program consisted of three-year ECB loans to banks and a broadening of the pool of assets that could be provided as collateral. The interest rate on the funds was tied to the ECB policy rate – there was no penalty involved.

Acharya, Pierret and Steffen (2020) show that, as a result of the ECB's LTROs program, the collateral value of eligible short-term risky Eurozone sovereign bonds improved. However, these LOLR operations increased the risky sovereign debt concentration in risky banks borrowing through the LTRO, which reduced the liquidity of those bonds due to fear of fire sales, thus raising both sovereign and bank risk. Jasova et. al. (2021) has a similar result for the 2009-2015 period – LOLR policy contributed to higher bank interconnectedness and systemic risk – through a slightly different channel – the haircut gap channel of LOLR. A higher haircut gap means that the ECB applies a more favorable valuation of the asset offered as collateral compared to the private repo market. This higher gap increases the borrowing capacity of banks against the collateral pledged with the ECB. This increases interconnectedness among banks by incentivizing banks to pledge higher haircut gap bonds, especially issued by similar banks and by systemically important banks. It also increases cross-pledging of bank bonds. Finally, and more positively, LOLR policies stimulate the issuance of higher haircut gap bonds by banks, which supports economic activity. In addition, the ECB's MMLR intervention through the announcement of the Outright Monetary Transactions program attracted new investors and reduced fire-sale risk in the Eurozone sovereign debt markets.

LTROs are not sterilized, which makes them part of the conventional monetary policy operations of the Eurosystem as well as enhanced LOLR operations.

Targeted longer-term refinancing operations (TLTROs). These were first announced on June 5th, 2014, with a second series (TLTRO II) on March 10, 2016, and a third series (TLTRO III) on March 7, 2019. The third TLTRO programme consists of a series of ten targeted longer-term refinancing operations, each with a maturity of three years, starting in September 2019 at a quarterly frequency. Borrowing rates can be as low as 50 basis points below the average interest rate on the de(posit facility over the period from 24 June 2020 to 23 June 2022, and as low as the average interest rate on the deposit facility during the rest of the life of TLTRO III. There is no penalty rate or other penalty terms and conditions. TLTROs also were not created in response to a potential funding and liquidity crisis, unlike the LTROs. TLTROs are targeted operations: the amount banks can borrow is linked to their lending to NFCs and households. Also, the more loans participating banks extend to NFCs and to households (except for home purchases), the more attractive the interest rate on their TLTRO III borrowings becomes. This could be viewed as a targeted monetary policy or credit operation (aiming to achieve a structural objective as regards the size and composition of bank lending rather than (or as well as) an enhanced LOLR operation.

Emergency Liquidity Assistance (ELA). Another set of enhanced LOLR operations have been implemented through ELA. These are collateralized emergency loans given by Eurozone NCBs ([starting in](#)

[Belgium in 2008](#)) to financial institutions (mostly banks). They are subject to a penalty interest rate and haircuts on the collateral. They are sterilized.

These enhanced LOLR arrangements were, in principle, open-ended. Additional LTROs, TLTROs and ELA operations are possible.

MMLR measures

Securities Markets Programme (SMP). As regards MMLR operations, the SMP qualifies (see [Smith \(2020\)](#)). It was introduced on May 10, 2010 and terminated when the Outright Monetary Transactions (OMT) program was created on September 6, 2012. The SMP permitted interventions in the secondary public securities markets of euro area Member States and in both the primary and secondary private debt securities markets. The program targeted bonds with two to 10 years maturities. All transactions were fully sterilized. When it was terminated, purchases made under the SMP totaled €218 billion, to be held to maturity.

Outright Monetary Transactions (OMT). The ECB declaring itself to be a potential buyer of last resort of euro area sovereign debt through OMT in July 2012 (with the programme initiated in September 2012), is a clear example of an MMLR activity. Liquidity was provided to the market as a whole (rather than just to banks as with LTROs) by purchasing or promising to purchase Eurozone sovereign bonds in the secondary bond markets. These purchases are fully sterilized. Under the OMT program, the ECB could buy unlimited amounts of Eurozone government bonds with maturities of one to three years provided the beneficiary country met three conditions. First, the country had to receive financial support from the European Financial Stability Facility/European Stability Mechanism (EFSF/ESM) and had to be compliant with the terms of the EFSF/ESM program. Second, the OMT program could be activated only if the country had regained complete access to private lending markets. The likelihood of complete access is, of course, not independent of the prospect of OMT purchases. Third, the country's government bond yields had to be higher than what could be justified by the economic fundamentals. No sovereign bonds were ever purchased by the ECB under the OMT program, yet it was singularly effective in preventing fire sales by weak banks of the debt of weak sovereigns (see e.g., Acharya et. al. 2020).

The OMT is an open-ended, potentially permanent arrangement.

Covered Bond Purchase Programs (CBPPs). Also initiated during the European sovereign debt crises were the ECB's Covered Bond Purchase Programs 1 and 2 (CBPP1 (€60 billion) and CBPP2 (€40 billion)). CBPP1 was launched in July 2009 and terminated in June 2010. CBPP2 was launched on 3 November 2011 and terminated on 31 October 2012. Both targeted private bonds issued in the euro area, to be purchased in both the primary and the secondary markets. Eligible counterparties were domestic counterparties participating in Eurosystem monetary policy operations (i.e., banks) and any other counterparties that are used by Eurosystem central banks for the investment of their euro-denominated portfolios. The ECB [states](#) that "For outright transactions, no restrictions are placed a priori on the range of counterparties".

In mid-2014, the ECB initiated its Asset Purchase Programme (APP), which consisted of four programs: The Corporate Sector Purchase Programme (CSPP), the Public Sector Purchase Programme (PSPP), the Asset-backed Securities Purchase Programme (ABSPP) and the third Covered Bond Purchase Programme (CBPP3). All four programs have MMLR overtones, although the PSPP is the least convincing example, as

it only buys investment-grade debt, ruling out purchases of Greek sovereign debt. All four programs were reactivated for purchases on 1 November 2019 – prior to the start of the Covid-19 pandemic.

The ECB's enhanced LOLR and MMLR activities during the Covid-19 pandemic

Like the Fed, the ECB increased its LOLR operations and its outright asset purchases starting in March 2020, but the scale and scope of its additional enhanced LOLR and MMLR operations were significantly below those undertaken by the Fed.

Some additional LTROs were announced as early as March 12, 2020, which can be viewed as an enhanced LOLR action, although a good case can also be made that this was just (or also) an example of enhanced monetary policy at the effective lower bound (ELB) – asset purchases and sales by central banks can serve multiple purposes at the same time and change their purpose(s) over time.

On April 7, 2020, the ECB temporarily expanded the list of assets that banks can use as collateral and reduced the magnitude of the “haircuts” at the main refinancing operations and at the marginal lending facility. These were enhanced LOLR measures. Specifically, the ECB eased the conditions for the use of credit claims as collateral. The ECB also adopted a general reduction of collateral valuation haircuts. Importantly, the ECB adopted a waiver of the minimum credit quality requirement for marketable debt instruments to accept Greek sovereign debt instruments as collateral in Eurosystem credit operations. In addition, it announced it would assess further measures to temporarily mitigate the effect on counterparties' collateral availability from rating downgrades (it did so on April 22, 2020). This made it possible to accept as collateral loans with lower credit quality, loans to other types of debtors not accepted in the ECB's general framework, and foreign-currency loans.

Greek sovereign debt instruments are now also eligible for outright purchase under the Pandemic Emergency Purchase Programme (PEPP) – a clear MMLR measure initiated in March 2020. The €1.85 trillion PEPP itself is an example of enhanced monetary policy at the ELB.

These enhanced LOLR and MMLR measures are temporary for the duration of the pandemic crisis and linked to the duration of the PEPP, whose horizon for net purchases was extended to the end of March 2022. The period during which it will reinvest the principal payments from maturing securities was extended till at least the end of 2024.

In addition, as part of its regular review of its risk control framework, the Governing Council decided to reduce the haircuts applied to non-marketable assets, which can be viewed as an enhanced LOLR action. This was a permanent measure.

In June 2020, the ECB created EUREP, a euro repo facility for foreign central banks, akin to the Fed's FIMA. EUREP pricing is set in a way that makes it attractive only under adverse market conditions. The facility is open-ended.

The creation in July 2022 of the Transmission Protection Instrument (TPI) is another example of an MMLR. The official reason for its creation is to support the effective transmission of monetary policy – to ensure that the monetary policy stance is transmitted smoothly across all euro area countries. It really is a less demanding version of the OMT (it does not require countries whose debt is being purchased to have an active EFSF/ESM programme) and it can

purchase securities (including in principle private securities) with remaining maturities between one and ten years. The TPI has not yet been activated and is open-ended.

3.3. The Bank of England

The Bank of England's enhanced LOLR and MMLR activities during the GFC

The first LOLR measures undertaken by the Bank of England (BoE) occurred with the failed attempt to rescue Northern Rock in the fall of 2007, which involved both ELA and a blanket deposit guarantee by the government to stop the run on the bank. It was taken into public ownership in 2008.

In December 2007, the BoE introduced Extended Collateral Long-Term Repo (ELTR) operations that provided three-month funding against 'wider collateral'. Usage peaked at €180 billion in January 2009. It was replaced in June 2010 by Indexed Long-Term Repos (ILTR). Both were LOLR arrangements.

Special Liquidity Scheme (SLS). This LOLR arrangement was introduced in April 2008, following the collapse of Bear Stearns, as a temporary measure. Under the SLS, UK banks could exchange high-quality assets that had temporarily become illiquid for UK Treasury bills. The SLS expired in January 2012.

ELA. After Northern Rock's ELA, the failure of Lehman Brothers on September 15, 2008, triggered ELA in 2008-09 to Halifax Bank of Scotland and Royal Bank of Scotland. There also were substantial government recapitalization packages for both banks. Solvency had been clearly impaired, and these were (fiscal) recapitalization measures as well as LOLR operations.

In October 2008, the BoE created a permanent Discount Window Facility (DWF), an LOLR facility which provides liquidity to counterparties on a bilateral basis against a wide range of collateral, ranging from US treasuries and German bunds to self-originated ABS. The Standing Facilities which had played this role were relaunched as the Operational Standing Facilities (OSFs), more clearly intended to cope with operational disruptions and short-term market volatility.

In January 2009, the Bank of England Asset Purchase Facility Fund Limited was created – a wholly-owned subsidiary of the Bank of England, which holds the assets purchased under the Asset Purchase Facility (APF). The initial size of the Facility was €50 billion. It could buy commercial paper, corporate bonds, bonds issued under the U.K.'s Credit Guarantee Scheme, syndicated loans and asset backed securities "created in viable securitization structures". What started off as an MMLR facility aiming to enhance the availability of credit to UK corporate borrowers by boosting liquidity and trading activity in corporate credit markets soon (in February 2009) had its remit expanded to include regular monetary policy objectives and fiscal support through QE. Most of its balance sheet is not the result of MMLR operations but of expansionary monetary policy at the ELB (quantitative easing (QE)). On February 2, 2022, the MPC voted to begin reducing the stock of assets held by the APF. As of 28 September 2022 APF gilt holdings were €838.0 billion and holdings of sterling non-financial investment-grade corporate bonds were €18.9 billion. On September 28, 2022 the Bank of England, through the APF announced emergency purchases of gilts (to conclude on 14 October 2022), to counter severe market disorder. The cap on the APF was increased by €100 billion to €966 billion. The beginning of gilt sale operations that were due to start on 3 October 2022 was postponed till 1 November 2022. This was an MMLR intervention, even though it was not sterilized.

Funding for Lending Scheme (FLS). This LOLR scheme was launched in July 2012. It offered collateralized funding to banks and building societies for an extended period on terms that became more lenient as banks lent more. Banks and building societies were able to borrow UK Treasury bills from the BoE for a period of up to 4 years against Discount Window Facility (DWF)-eligible collateral, for a fee. They were able to borrow up to 5% of their stock of existing lending to the real economy, plus any net expansion of lending during a reference period - from end-June 2012 to end-December 2013. The price of each institution's borrowing in the FLS depended inversely on its volume of lending to the real economy during the reference period.

Extended Collateral Term Repo (ECTR) facility. This LOLR scheme was introduced in December 2011. It permitted the BoE to offer 30-day sterling liquidity in an auction format against a wide range of collateral – any collateral pre-positioned for use in the Bank's DWF. All firms registered for access to the Bank's DWF (banks and building societies) would be eligible for ECTR operations. It was replaced in 2014 by the Contingent Term Repo Facility

Indexed Long-Term Repo (ILTR). This LOLR facility, created in June 2010, as a successor to and replacement for the temporary Extended Collateral Long-Term Repo facilities (ELTRs), allows market participants to borrow central bank reserves for longer periods (up to six-month) against a wide range of collateral.

The BoE chose to formalize, and put into the public domain, most of its liquidity insurance tools by publishing the updated Sterling Monetary Framework (SMF) (the 'Red Book') on December 10, 2010. In addition to the standard monetary policy open market operations tools, it contained three further liquidity insurance/LOLR facilities, the ILTR, the DWF and a discretionary Contingent Term Repo Facility (CTRF) that the Bank can launch at its discretion and on terms and conditions of its choosing. The CTRF was only formally established in 2014 when it replaced the Extended Collateral Term Repo (ECTR) facility. It was activated for the first time in March 2020.

The BoE did of course participate in the bilateral dollar liquidity swap arrangements and the foreign-currency liquidity swap arrangements established during and following the GFC. These can be viewed as international LOLR facilities.

From the spring of 2009, the BoE conducted large-scale QE purchases of public sector debt (mostly monetary policy) and smaller-scale purchases of private sector securities (conducted as part of its monetary policy implementation, but with clear MMLR overtones).

The BoE's enhanced LOLR and MMLR activities during the Covid-19 pandemic

On March 11, 2020, the BoE announced the Term Funding Scheme with additional incentives for SMEs (TFSME), offering four-year funding at or very close to Bank Rate.

There was an element of enhanced LOLR here, because (among other things) the TFSME will "provide participants with a cost-effective source of funding to support additional lending to the real economy, providing insurance against adverse conditions in bank funding markets;" It opened for drawings on 15 April 2020. On 2 May 2020 TFSME participants were enabled to extend the term of some of the cheap funding they access via the TFSME to align with the 6-year term of loans made through the Treasury's

Bounce Back Loans Scheme. The TFSME is a temporary facility. Following an extension on 17 December 2020, the extended Drawdown Period will run until 31 October 2021 and the extended Reference Period until 30 June 2021.

On March 17, 2020, HM Treasury and the BoE announced the creation of the Covid Corporate Financing Facility (CCFF). The Bank implemented the facility on behalf of the Treasury. This is an MMLR operation where the financial risk is borne by the Treasury. The CCFF provides funding to businesses by purchasing outright commercial paper of up to one-year maturity issued by firms. The facility offers financing on terms comparable to those prevailing in markets in the period before the Covid-19 economic shock and will be open to firms that can demonstrate they were in sound financial health prior to the shock. Eligibility will be based on firms' credit ratings prior to the Covid-19 shock. Businesses do not need to have previously issued commercial paper in order to participate. Note that any penalty terms are de minimis. The CCFF closed to new purchases on 23 March 2021. It will continue to hold companies' commercial paper until the final maturities in March 2022.

Contingent Term Repo Facility (CTRF). On March 24, 2020, the BoE activated the Contingent Term Repo Facility (CTRF) – a temporary enhancement to its sterling liquidity insurance facilities.

The CTRF is an enhanced LOLR facility that allows creditworthy participants to borrow central bank reserves (cash) for three months in exchange for less liquid collateral. It complements the Bank's existing liquidity facilities, the DWF (up to 30 days, with the option of rolling DWF drawings) and the ILTR (a six-month facility). Prevailing market conditions are taken into account when setting the terms of the CTRF, which allows in principle for penalty terms to be imposed. The final operation of the CTRF took place on 26 June 2020.

For the LOLR operations, the eligible counterparties are restricted to regulated entities: Banks and Building societies (eligible for all LOLR operations), Broker-dealers (eligible for most) and Central counterparties (eligible for a few).

There have also been examples of high-risk LOLR-like facilities being set up by the UK government directly, bypassing the central bank completely. The first example is the Bounce Back Loan Scheme (BBLS), announced on 27 April 2020 and closed to new applications and top-up applications on 31 March 2021. The scheme gave eligible lenders a 100% government-backed guarantee against the outstanding balance of the facility. A lender could provide a six-year term loan from £2,000 up to 25% of a business's turnover, up to a maximum loan limit of £50,000.

Another example is the Coronavirus Business Interruption Loan Scheme (CBILS), announced by the UK government on 23 March 2020 and closed to new applications on 31 March 2021. It helped small and medium-sized businesses to access loans and finance up to £5 million. The government guaranteed 80% of the finance to the lender and paid interest and any fees for the first 12 months. A closely related example is the Coronavirus Large Business Interruption Loan Scheme (CLBILS) set up by the UK government on April 3, 2020. It was closed to new loan applications on 31 March 2021. It provided up to £200 million financial support to medium and large sized businesses affected by the coronavirus. The government guaranteed 80% of the finance to the lender.

Another example is the Recovery Loan Scheme (RLS) which was announced by the UK government on 3 March 2021 and launched on 6 April 2021 to help businesses of any size access loans and other kinds of

finance (up to £10 million per business). It was scheduled to be open until 31 December 2021. Again, the government guaranteed 80% of the finance to the lender.

There is a fuzzy, grey area where LOLR and MMLR activities merge with industrial policy and with pure fiscal interventions (subsidies and other forms of fiscal support) that cannot be justified as corrections of imbalances caused by a funding liquidity or market liquidity crunch. The four government-run and government-funded schemes just mentioned (BBLS, CBILS, CLBILS and RLS) as well as the Future Fund launched on 20 May 2020, appear to go well beyond liquidity support schemes – they address insolvency risk driven by the sudden worsening or even vanishing of output markets and the disappearance of key productive inputs. It would not be the job of an LOLR and MMLR to address such potential bankruptcy drivers – these are (indirect) fiscal recapitalization arrangements.

4. How should an MMLR be structured?

Obviously, the MMLR, like the LLOR, would be the central bank (or a public or private entity with unrestricted and unconditional access to the financial resources of the central bank). Ideally, the central bank would buy securities outright for its own account. The resulting increase in risk exposure can (in my view should) be shared with (preferably comprehensively transferred to) the fiscal authority (the Treasury department of the central government for most NCBs). This is discussed below. Unfortunately, some central banks are subject to severe constraints on the financial instruments they can buy outright. For instance, Section 14 of the Federal Reserve Act restricts the securities that the Federal Reserve is authorized to buy and sell, to gold, government and agency securities and bills of exchange. It is a mystery to me why the range of assets that can be accepted as collateral in Fed repo operations (including its LOLR operations) is so much wider than the range of assets that can be bought and sold outright.⁴

To get around this constraint on the assets it can buy and hold outright, the central bank may create one or more special purpose vehicles (SPVs), likely wholly owned by the central bank, to perform the outright purchases that shape the MMLR role. A first-best solution would, however, be to modify Section 14 of the Federal Reserve Act to enable the Fed to buy an essentially unrestricted range of domestic and foreign financial instruments.

As an alternative, central banks could offer to lend to private entities that will purchase the MMLR-designated securities. The division of labor between the central bank and the private market maker

⁴ The list of securities and loans that constitute acceptable collateral at the [Fed discount window](#) is vast. The Asset Eligibility Table includes U.S. Treasury and Fully-Guaranteed Agency Securities, GSE Securities, Foreign Government Guaranteed Securities and Brady Bonds, Foreign Government Agencies, Supranationals, Corporate Bonds, German Jumbo Pfandbriefe, Municipal Bonds, ABS, CDOs, CLOs, Agency-Backed Mortgage Securities, Non-Agency Residential Mortgage-Backed Securities, CMBS, Trust Preferred Securities, CDs, Bankers' Acceptances, Commercial Paper and ABCP. The eligible loan types include Commercial and Industrial Loans, Agricultural Production Loans, Agricultural Loans secured by Farmland, Commercial Real Estate Loans, Owner Occupied Nonfarm Nonresidential CRE, Construction Loans, Raw Land Loans, Consumer Loans, Consumer Leases, Home Equity Loans or Lines secured by residential property, 1-4 Family Residential Mortgage Loans, Student Loans, Credit Card Receivables, US Agency Guaranteed Loans and Obligations of states and political subdivisions.

would be highly complicated, especially when it comes to setting appropriate penalty terms to discourage moral hazard. Because insolvency and illiquidity are often hard to distinguish, especially when markets are disorderly, it is key that the MMLR (like the enhanced LOLR) have deep pockets – and/or a comprehensive fiscal backup guarantee. I believe no private entity qualifies here. In the Covid era the Fed has provided enhanced LOLR assistance through existing private entities, using the Money Market Mutual Fund Liquidity Facility and the Paycheck Protection Program Liquidity Facility, but all MMLR facilities it created were through SPVs that were part of the Federal Reserve. I believe direct purchases and sales by the central bank or through an SPV fully owned by the central bank is the right way to proceed – if this is legally possible.

For the Eurosystem, it is not enough to determine that the central bank is the MMLR, because this leaves open the question as to whether the MMLR role should be fulfilled exclusively by the 20 national central banks or whether there could be a role for the ECB. It could be left to the sole discretion of the 20 NCBs provided they are considered fully creditworthy. There is a potential problem here, because NCBs in the euro area do not have the ability to create money (currency or bank deposits with the central bank) at will. Money creation is a collective decision by the Governing Council of the ECB (the six members of the Executive Board of the ECB and the governors of the 20 NCBs). This means that, in principle, there is credit risk attached to obligations of the NCBs even if these are euro-denominated. In extremis this could prevent an NCB from acting as an LOLR - even for euro-denominated collateralized transactions – and from acting as an MMLR - even for euro-denominated financial instruments. To get around this problem the ECB would have to act as LOLR for the NCBs. The financial interactions between the ECB and the 20 NCBs do not now include any discount window-type facilities. The closest we get to any financial support mechanism are the Target2 balances of euro area NCBs vis-à-vis the ECB, which are part of the Intra-Eurosystem liabilities – Other liabilities within the Eurosystem (net) in the ECB's balance sheet. A proper Discount Window Facility with the ECB for the euro area NCBs could well be desirable.

Should the enhanced LOLR and MMLR have a fiscal backstop?

Does the central bank need a fiscal guarantor/backstop for its MMLR and enhanced LOLR transactions? We have seen some fiscal involvement on a number of occasions both in the US and in the UK – but not for all LOLR and MMLR facilities. In the US, since the start of the Pandemic, the US Treasury has made equity investments in one LOLR facility (\$ 10 billion in the Term Asset-Backed Securities Loan Facility) and five MMLR facilities – the Commercial Paper Funding Facility (\$10 billion), the Municipal Liquidity Facility (\$35 billion), the Primary Market Corporate Credit Facility (\$75 billion jointly with the SMCCF), the Secondary Market Corporate Credit Facility (\$75 billion jointly with the PMCCF) and the Main Street Lending Program (\$75 billion). These programs had all been established under Section 13(3) of the Federal Reserve Act, with approval of the Treasury Secretary. The Treasury equity investments were in all cases significantly smaller than the maximum possible size of the funding under the various programs. The fiscalization of the credit risk and other risks of the programs was partial/incomplete.

An example of the government assuming all the risk associated with a facility managed/operated by the central bank is the UK's Covid Corporate Financing Facility. The Bank of England implemented the facility on behalf of the Treasury, which assumed 100% of the credit risk involved. The central bank is the agent of the government, with no risk exposure as a result of its actions.

In the discussion of LOLR-like measures undertaken in response to the Covid-19 crisis by the UK government directly (the Bounce Back Loan Scheme, the Coronavirus Business Interruption Loan Scheme, the Coronavirus Large Business Interruption Loan Scheme, and the Recovery Loan Scheme) we concluded that these were (indirect) fiscal recapitalization measures rather than LOLR operations to address funding and market liquidity issues. They are, naturally, on the balance sheet and for the account of the government. What about the risk – overwhelmingly credit risk and market risk – unavoidably associated with proper LOLR and MMLR activities under conditions of funding and market illiquidity?

On balance I believe that there should be a full fiscal assumption of all the risks associated with (enhanced) LOLR and MMLR activities. This can be done in a number of ways. I will consider just two. The first is for the LOLR and MMLR activities to be conducted by an SPV that is managed by the central bank but 100% owned by the Treasury. The central bank has no financial interest in the SPV. The second is for the central bank to conduct LOLR and MMLR operations for its own account and on its own balance sheet, but for the Treasury to reimburse the central bank fully for any losses associated with these operations. Should there be any profits associated with the LOLR and MMLR operations, the Treasury would be entitled to them.

How would a fiscal backstop be implemented in the Euro Area? National central banks backed by national Treasuries? NCBs backed by a centralized fiscal authority? The ECB backed by a centralized fiscal authority? Many different arrangements are possible, although the arrangement where each NCB is backed only by its own Treasury is bound to fail because of differential national sovereign risk. The range of sovereign credit ratings in the Eurozone is daunting. If we define sovereign default as the triggering of the credit default swaps (CDS), we have had two sovereign defaults (Greece and Cyprus) since the GFC. The euro area member states' S&P credit ratings range (as of January 27, 2023) from AAA (Germany, Luxembourg, and the Netherlands) to BBB+ (Croatia), BBB (Italy, Portugal and Cyprus) and BB+ (Greece). I believe it is unavoidable that cross-border fiscal risk sharing is part of the fiscal backstop arrangements for Eurozone LOLRs and MMLRs.

Which markets are important enough to warrant a public backstop in the form of an MMLR facility?

The selection of the securities for which an MMLR facility is on standby will be country-specific and will change over time. It should include any financial instrument whose market's illiquidity inflicts serious, and potentially systemically significant, financial hardship on the parties holding it and trying to sell it. I would not restrict the list of MMLR-eligible securities to financial instruments that figure prominently on the balance sheet of banks or NBFIs (e.g., money market funds (MMFs)). Securities held principally by non-financial corporations (NFCs) and indeed by households can be systemically important. A key constraint on inclusion is that it must be possible for the MMLR (the central bank) to determine appropriate buying and selling prices for the financial instrument in question, at times when illiquid market prices provide no useful information.

First on the list would be investment grade private bonds (both regular bonds and covered bonds) and general government bonds. It is important that all levels of government be included – federal/central, state, provincial and local/municipal. At times non-investment grade bonds (and other financial

instruments) should be added to the list of MMLR-eligible securities. The ECB provided an example of this when they made non-investment grade Greek sovereign debt eligible for purchase under the PEPP in 2020 (and agreed to accept Greek sovereign debt instruments as collateral in Eurosystem credit operations – an enhanced LOLR measure).

Next on the list of MMLR-eligible securities would be equity. Note that bonds and equity often can be traded through exchange trade funds (ETFs). I would add such ETFs to the list.

My list of likely or potentially MMLR-eligible securities is a long one. I will just list some of the principal categories: repos and reverse repos; loans; asset-backed securities; collateralized debt obligations; collateralized loan obligations; credit default swaps; interest rate swaps; other interest rate derivatives; residential mortgage-backed securities; commercial mortgage-backed securities; SME securitizations (securitized SME loans) and whole business securitizations.

The list is not exhaustive, and it is subject to change as economic structures and financial configurations evolve. An interesting question is whether the MMLR should ever get involved in the purchase and sale of key, strategic commodities, like oil, gas, metals, agricultural commodities and perhaps, in the future, water. My inclination is to suggest a cautious ‘yes’ as an answer to this question. Commodities markets and markets for commodity derivatives are key asset markets that can malfunction and cause financial chaos with potentially serious repercussions for the real economy.

Which counterparties are important enough to warrant a public backstop in the form of an MMLR facility?

Once the MMLR-eligible financial instruments have been selected, any would-be buyer or seller of any of these eligible instruments would be an eligible counterparty, including, in principle, non-financial corporates and households. This is because in outright purchases and sales the principal risk is the riskiness of the security that is being traded. The counterparty only adds settlement risk.⁵ The central bank can avoid settlement risk by making sure that any security it purchases has been delivered prior to or at the same time as it makes its purchase payment and that any security it sells has been paid for prior to or at the same time as its delivery – a strong form of Delivery Versus Payment (DVP).

If unrestricted counterparty eligibility is a bridge too far, I would expect to see the following order of prioritization:

- banks/monetary financial institutions;
- central counterparties;
- money market funds;
- non-MMF investment funds, including equity funds; bond funds; mixed funds; real estate funds; hedge funds; UCITS funds; “other” funds;
- insurance corporations and pension funds;
- other financial institutions;
- public and private international financial institutions (including foreign banks and central banks);
- general government (federal, state, and local);

⁵ “Settlement risk is the risk that a counterparty fails to deliver a security or its value in cash as per agreement when the security was traded after the other counterparty or counterparties have already delivered security or cash value as per the trade agreement”. ([Wikipedia](#))

- non-financial corporations;
- households (which would bring us back to unrestricted eligibility).

Should the MMLR include features resembling Bagehot’s “penalty rates” to prevent moral hazard?

The answer is a clear “yes”. Moral hazard – counterparties taking on excessive risk – is an unavoidable consequence of the creation of financial market backstops like the MMLR and the enhanced LOLR. The practical implementation of the MMLR function can be done in many different ways. In the simplest case, the central bank could announce that for the next N trading hours/days, it would buy any amount of a given type of a (possibly credit-impaired, illiquid) security with a risk-free price P , at a price $P1 < P$. The discount relative to the risk-free price $P - P1$ would reflect the central bank’s assessment of the risk fundamentals and of the penalty required to minimize moral hazard.

Note again that the price set by the central bank would be determined without the benefit of a contemporaneous (orderly) market price for the security. The risk-free price will not be observed in disorderly, illiquid markets. The central bank must be capable of modeling illiquid, credit-impaired asset prices – a daunting task, but there is no alternative.

As regards the enhanced LOLR role, note that by engaging in both repos and reverse repos for the same illiquid private financial instruments, the central bank could establish the same implicit buying price $P1$ as it can through outright purchases of these instruments. In the case of repos, the penalty component of the contract would be determined both by the relationship of $P1$ to the risk-free price, and by any 'haircuts' (additional liquidity discounts) applied to the valuation of the collateral by the central bank.

Should the enhanced LOLR and MMLR transactions be sterilized?

To differentiate enhanced LOLR lending and MMLR purchases from expansionary monetary policy, it makes sense to sterilize such lending and asset purchases, if possible. If the scale of the operation is massive – as it was with the Fed’s T-bill purchases in starting in March 2020 - sterilization may not be feasible. It is also possible that expansionary monetary policy through asset purchases is being pursued at the same time that market illiquidity or funding illiquidity are being addressed. Clarity and guidance from the central bank are essential here.

Should this be a standing facility with limited discretion?

Standing facilities are arrangements that enable transactions with central banks which are initiated by central banks’ counterparties rather than by central banks, without restriction under normal circumstances. A LOLR standing facility allows eligible counterparties to borrow from the central bank against eligible collateral at a fixed rate, at the discretion of the counterparties. An MMLR standing facility allows eligible counterparties to sell any amount of a qualified security to the central bank at a fixed price, at the discretion of the counterparties.

The Fed’s discount window facilities (Primary Credit, Secondary Credit and Seasonal Credit) are effectively standing facilities. The Fed has now created a standing (overnight or more general short term) repo facility, the SRF, that permits banks and a wider range of counterparties to convert

Treasuries to reserves on demand at an administered rate that does not appear to include even a modest penalty element.

The Eurosystem has two overnight standing facilities: the marginal lending facility and the deposit facility. The Bank of England has its Reserves Accounts and Operational Standing Facilities (OSFs).

Limited discretion (for the central bank) refers to the choice as to whether the facility is on or off and how the pricing, including any penalty terms, is determined.

As regards enhanced LOLR facilities, I believe that these could be standing facilities, as is the case with the historical LOLR facilities. The terms and conditions for access should be clear – in the public domain preferably. This certainly should apply to the treatment of the collateral. The full terms and conditions (interest rates and haircuts) will of course also depend on the central bank's assessment of the creditworthiness and financial health of the would-be counterparty – LOLR loans are recourse loans.

I do not believe the MMLR should be just a standing facility. It should be possible for transactions to be initiated by the central bank as well as by the central bank's counterparties.

As regards limited discretion, I believe the MMLR facility should always be “on” – willing to buy at a set price. The appropriate penalty terms are determined at the discretion of the central bank. The buying prices of all securities that are in principle available for purchase by the central bank acting as MMLR should be clear – in the public domain as a rule.

Should the MMLR engage in secondary market transactions only?

I believe it should be possible for central banks acting as MMLR to engage in primary market transactions as well as in secondary market transactions. The prohibition of primary market purchases of Eurozone sovereign debt (a consequence of the prohibition of “monetary financing” in Article 123 (1) TFEU) should be eliminated. Primary market transactions should be authorized in both public and private debt instruments, as well as in other private assets, including equity-like instruments. Clearly, primary market transactions counterparties are restricted to the issuers of the securities that are approved for MMLR transactions.

Should the LOLR provide foreign currency loans/support and should the MMLR purchase foreign-currency-denominated securities?

The appropriate answer here is a cautious “yes”. Making foreign currency loans (even if collateralized) and engaging in outright purchases of foreign currency-denominated financial instruments potentially increases the risk exposure of the central bank. I do not believe this risk should be avoided, but it should be calibrated carefully, along with the other sources of market and credit risk. We also have the specifically international LOLR arrangements with foreign and international monetary authorities. These were initiated following the GFC (including the dollar liquidity swap arrangements and the foreign currency liquidity swap arrangements) and boosted again in March 2020 when the scope of the U.S. dollar liquidity swap lines was expanded and the FIMA Repo Facility was created, followed by the ECB's creation of EUREP – a euro repo facility for foreign central banks.

Should LOLR and MMLR operations be open/public or covert?

MMLR operations – size and terms – are and should be in the public domain. As regards LOLR operations, ultimately, the total amount of bilateral support provided, and the terms, must be in the public domain. Is there ever a case for keeping LOLR loans covert for a period in the interest of maintaining financial stability? I would keep that option open, just in case, but would not expect it to be invoked often, if at all.

The use of LOLR facilities is often stigmatized. Is this inevitable? And if it is inevitable, does this provide grounds for keeping LOLR operations secret? Is there any stigma attached to the use of MMLR facilities?

I do not believe any stigma has been attached to recourse to MMLR operations since the GFC. Firms selling securities to (an SPV created by) the central bank or to some private entity funded by the central bank will be punished by the markets if they sell at what are deemed unnecessarily low prices or buy at unnecessarily high prices, but there is no further stigma associated with such transactions. The stigma associated with LOLR transactions derives from the belief that to engage in an LOLR transaction is evidence of, indeed a signal of, a lack of financial viability – of potential insolvency risk. That problem is likely to diminish if the number of counterparties increases and the range of eligible collateral is enhanced. Greater openness about the financial circumstances of the LOLR counterparties would also help. Any residual stigma the counterparties will have to live with. This is not a first-order issue. It certainly is not a sufficient reason for keeping LOLR operations secret, even temporarily.

Should enhanced LOLR and MMLR arrangements be temporary or permanent?

I strongly support a permanent status for the enhanced LOLR and MMLR arrangements. I also firmly believe that the terms and conditions of access to these facilities should be such that they are only active under exceptional circumstances – because they are sufficiently punitive to be unattractive during normal times. They would therefore be expected to be idle most of the time – assuming we have not entered an era of permanent financial market dislocations.

5. Conclusion

The enhanced lender of last resort and market maker of last resort roles of the central bank that emerged during the Great Financial Crisis, the Eurozone sovereign debt crisis and the Covid-19 pandemic are here to stay. Design and implementation vary widely across central banks. The key issue of the moral hazard – excessive risk taking by central bank counterparties and issuers of MMLR-eligible financial instruments - has not thus far been addressed effectively. The financial stability role of the central bank is more systemically significant than its inflation-targeting mission or its dual mandate. The very notion of central bank independence must be rethought. The issues raised in this paper will be with us for years and likely decades to come.

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