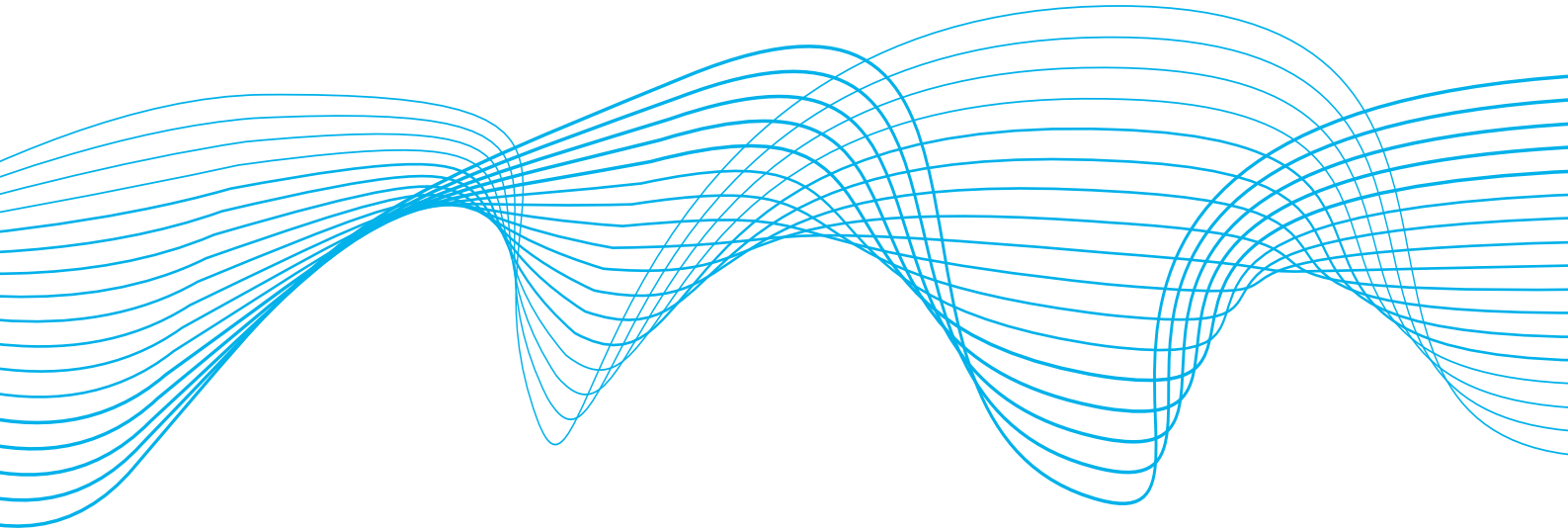
Reports of the Advisory Scientific Committee

No 13 / January 2023

Stabilising financial markets: lending and market making as a last resort

by
Willem Buiter
Stephen Cecchetti
Kathryn Dominguez
Antonio Sánchez Serrano



ESRB
European Systemic Risk Board
European System of Financial Supervision

Contents

Executive summary

Starting with the 2007-09 financial crisis and continuing through the coronavirus (COVID-19) pandemic, financial markets faced a series of severely adverse shocks. In response, central banks scrambled to update their policy toolkits. To ensure financial stability, safeguard the monetary policy transmission mechanism, and guarantee the continued flow of credit to the real economy, they expanded their lending operations to restore funding liquidity and intervened in financial markets directly, purchasing securities to restore market liquidity. After all, without well-functioning financial markets and a stable financial system, policymakers would never be able to meet their price stability or dual mandate.

In their traditional lending operations, central banks make loans to banks and other intermediaries against a limited set of high-quality collateral. Today, a much wider range of collateral is accepted in enhanced lending operations directed at ensuring credit flows to non-bank financial institutions (NBFIs) and non-financial firms. Furthermore, the experience following the 2007-09 financial crisis shows that central banks' enhanced lending to impaired market makers has often succeeded in restoring their market making capacity, obviating the need for direct purchases.

Advanced economy central banks are now less hesitant to intervene directly in markets, purchasing both government and privately issued securities in an effort to stabilise financial markets they view as systemic. At least initially, policymakers considered such policies to be extraordinary measures for extraordinary circumstances. However, as policymakers intervened massively during the 2007-09 financial crisis and in the early stages of the COVID-19 pandemic, markets are likely to expect policymakers to use these instruments again if faced with similar circumstances.

This report begins with the observation that central banks are now extensively employing enhanced lender of last resort (LOLR) and market maker of last resort (MMLR) facilities, often putting them in place quickly and in a manner that leaves little time to reflect on their structure. With that in mind, we take a step back and examine how authorities that feel compelled to use them again might design enhanced LOLR and MMLR facilities to maximise their effectiveness while minimising the damage that they might cause.

We reach the following conclusions:

- The enhanced LOLR and the MMLR are public sector entities (or government-funded and government-guaranteed entities) that aim to ensure that systemic financial markets for domestic currency denominated securities remain liquid.
- An important justification for having enhanced LOLR and MMLR facilities is that, in addition to their central role in the monetary policy transmission mechanism, markets are increasingly becoming a significant source of financial and systemic risk.
- Establishing an enhanced LOLR or MMLR creates moral hazard, encouraging excessive risk taking and distorting prices. Reducing risk-taking incentives and minimising the impact on prices requires that authorities strike a complex balance. The cost of borrowing from the enhanced LOLR or selling to the MMLR should be set so that both options are unattractive in

normal times but appealing relative to the expensive alternatives in stress periods. In addition, rigorous regulation and supervision of those that may benefit from enhanced LOLR and MMLR facilities can further mitigate moral hazard.

- It is essential that the enhanced LOLR and the MMLR have balance sheets that can expand quickly, lending to qualified counterparties or purchasing securities in almost unlimited amounts. This means that the enhanced LOLR and the MMLR must be either the central bank itself or an agent with unlimited access to the central bank whose solvency is unquestioned.

- The evidence suggests that in many instances, authorities can achieve their market stabilisation objective either as an enhanced LOLR, lending in domestic currency to regulated private agents acting as market makers, or as an MMLR that stands ready to buy any quantity of a given domestic currency denominated security offered at a set price.

- The enhanced LOLR and the MMLR are capable of achieving the same stabilisation goal except in the following circumstances: (1) when concerns about the quality of the securities cause the market to disappear, (2) when private market makers become concerned that they will be the only participant left in a market as a buyer, (3) when regulatory constraints on balance sheet size bind, (4) when speed is of the essence, and (5) when it is impossible for the authorities to establish the solvency (or identity) of potential borrowers.

Our analysis of the possible design features and potential costs, combined with our survey of central banks' experiences, lead us to develop a set of desirable attributes for an effective enhanced LOLR and MMLR. These include supporting only financial markets that are deemed essential; lending only to regulated institutions to ensure solvency; developing an ongoing capacity to price securities accepted as collateral in a lending operation or purchased outright; offering pricing that is unattractive in normal times to reduce moral hazard; and once market liquidity has been restored, exiting quickly and in a manner that minimises the impact on market prices.

1 Introduction

Financial markets play a central role in advanced economies. How well they work affects the ability of firms, households and governments to access credit, manage investment portfolios and control exposure to risk.[1] Financial markets have an established role in financial intermediation, ensuring the funding liquidity of banks and other key financial intermediaries. This means that many central banks consider the preservation of liquidity in key financial markets as critical if they are to ensure the stability of their domestic financial system. To quote from the ECB's monetary policy strategy, "Financial stability is a precondition for price stability and vice versa".[2] Put slightly differently, a stable financial system is key to both the smooth functioning of the monetary policy transmission mechanism and to ensuring the continued flow of credit to the real economy. Without stable financial markets, a central bank is not able to achieve its mandate.

In this report, we focus on two types of facilities that some central banks use to maintain liquidity in critical financial markets during periods of severe stress and dysfunction: enhanced lending operations as lender of last resort (LOLR) and direct interventions involving purchases of illiquid financial instruments as market maker of last resort (MMLR).[3]

Enhanced LOLR and MMLR facilities are not the first line of defence in stress periods. As their names imply, they are, or should be, a last resort. By adopting a macroprudential perspective that focuses on spillovers, interdependencies and systemic stability, financial regulators and supervisors now have a broad set of tools that allow them to address financial stability concerns. Officials regularly coordinate across regulatory and supervisory agencies responsible for different, but related, groups of individual financial institutions, instruments and markets. This more comprehensive, system-wide approach reduces, but does not eliminate, the potential for severe financial market turmoil. If critical financial markets become illiquid and especially if there are concerns that adverse liquidity spirals will lead to a broad-based contraction in credit to the real economy, then authorities may need to turn to these emergency lending and market making facilities.

The financial system is constantly changing. As it does, the nature of stresses evolves. This means that policies aimed at reducing the frequency and severity of systemic financial crises need to adjust as well. When it comes to stabilising financial markets, concerns regarding moral hazard traditionally led to policies aimed at aligning incentives for self-regulation. In a survey of the first 80 years of the Federal Reserve System's lending operations, Anna Schwartz noted the central bank's tendency to support insolvent as well as illiquid banks and concluded that "[a] Federal Reserve

---

1 Throughout the report, we use the term "government" to refer to the fiscal authority excluding the central bank.

2 See European Central Bank (2021).

3 Long before modern monetary policy was established, central banks served as LOLR against a limited set of high-quality collateral to maintain liquidity in government debt markets and for intermediaries that provide safe assets. The enhanced LOLR function that we focus on in this report involves lending to a wider range of financial institutions against a broader range of collateral. The term market maker of last resort (MMLR) was likely first used by Buiter and Sibert (2007) and then popularised by Tucker (2009). It is now widely used in macroeconomics and policy circles. Academic finance economists sometimes use an alternative term, buyer of last resort (BOLR), to describe the same types of facilities. In this report, we use the term MMLR as it better describes the objective of these facilities to restore liquidity in critical financial markets. By contrast, BOLR describes the side of the transaction that central banks take to restore market liquidity.

System without the discount window would be a better functioning institution".[4] It follows that enhanced LOLR and MMLR facilities will inevitably reduce private incentives to ensure that financial markets remain liquid. Once markets expect that central banks will intervene in a crisis, financial intermediaries and financial market participants may be emboldened to hold riskier, less liquid and less resilient balance sheets.

We begin this report with the observation that, in recent years, central banks regularly intervened in distressed financial markets to maintain liquidity. We do not ask whether this was the best policy response at the time, noting simply that recent global experience suggests the costs of inaction are acute.[5] Instead, given that central banks are likely to engage in similar actions again, we discuss how rigorous regulation and supervision, combined with appropriate pricing of lending and market making facilities, can minimise pricing distortions and moral hazard.

Faced with the possibility of a financial meltdown, authorities may feel compelled to intervene to restore liquidity and order in markets. It is in these circumstances that central banks started using LOLR and MMLR facilities during the 2007-09 financial crisis and continued throughout the COVID-19 pandemic. Policymakers are concerned with funding liquidity and market liquidity. That is, they focus on the timely availability of credit to finance the lending activities and asset purchases of banks and other financial intermediaries, and on the ability to swiftly sell or purchase a meaningful quantity of an asset without causing significant changes in price. If the willingness of private agents to trade financial instruments that are deemed systemically important is severely impaired (or threatens to become so), central banks can restore market liquidity. They can do this either indirectly, by acting as enhanced LOLR and making collateralised loans to private market makers or to other key purchasers of the securities, or directly, by acting as an MMLR and making outright purchases of the illiquid financial instruments.[6]

The appropriate choice of a last resort facility should depend on the circumstances and on the central bank's assessment of which financial markets, instruments and institutions are systemically important. Drawing on the definition of systemic risk in the ESRB Regulation 1092/2010[7], a systemically important financial market is one in which disruption could have negative consequences for the real economy. During the 2007-09 financial crisis some central banks intervened in markets that clearly fit the definition of systemically important. These include government and government-guaranteed debt markets, rated mortgage-backed securities markets, covered bond markets and equity index-backed exchange-traded funds (ETFs). During the COVID-19 pandemic this list was expanded to include corporate bond markets, other asset-backed securities markets, and in some countries, equity markets.

Some central banks have also recently played a crucial role in providing funding liquidity as an enhanced LOLR and ensuring market liquidity as an MMLR. Central banks are unique in that they can increase the size of their domestic currency balance sheets at will. This ability to create

---

4 See Schwartz (1992) as well as Bank for International Settlements (2022) and Rosenblum et al. (2008) for discussions on the impact of interventions by the public sector in the financial system.

5 See, for example, Reinhart and Rogoff (2011) and Lucas (2019) for discussions on the costs of financial crises and bailouts.

6 Note that an LOLR can be forcibly turned into an MMLR if the borrower defaults on the loan agreement and the LOLR 'acquires' the securities offered as collateral. The likelihood of this occurring would increase with the duration of the loan.

7 See Article 2(c) of Regulation No 1092/2010 of the European Parliament and of the Council of 24 November 2010 on European Union macro-prudential oversight of the financial system and establishing a European Systemic Risk Board.

domestic bank reserves and banknotes (base money) in unlimited quantities has clear risks, hyperinflation being one extreme example. However, when it comes to financial stability policy, the ability to create unbounded safe domestic currency liabilities means that central banks can act decisively to stabilise the domestic currency segment of the financial system when needed.[8] Over the years, central banks used their flexibility to stabilise their financial systems and, through them, their real economies. Central banks were able to buffer significant domestic currency funding and market liquidity shocks – regardless of their source – by lending to an increasingly wide range of financial and non-financial entities against an increasingly wide set of eligible collateral, as well as by purchasing a large and increasingly varied array of securities issued by private firms from a wide range of counterparties.[9]

In principle, central banks can use their balance sheets to stimulate economic activity and preserve or restore financial stability in various ways. These include: (1) monetary policy designed to influence aggregate demand when markets function normally and the monetary transmission mechanism works properly; this includes both conventional open market operations and unconventional asset purchases – when the policy rate is at the effective lower bound; (2) provision of credit to specific sectors or firms by means of selective support actions; (3) provision of funds to governments through emergency financing; (4) foreign exchange interventions to manage the external value of the currency; (5) collateralised lending to solvent firms facing liquidity stress; (6) outright asset purchases to address liquidity needs in specific securities markets; and (7) international lending operations in which central banks provide their national currencies to other central banks or international financial institutions, through currency swaps, repos or other means.[10]

Importantly, central bank balance sheet interventions can take multiple forms and their purpose can evolve over time. Examples are relatively easy to identify. The first includes quantitative easing (QE) and quantitative tightening (QT). These entail purchasing or selling long-duration securities to influence long-term interest rates, as well as targeting a longer-term interest rate (yield curve control) by buying or selling as many bonds as required to hit the target rate. Most central bank purchases and sales of government bonds fit into the QE or QT category.[11] Likewise, examples of credit support abound. One is the Eurosystem's sequence of three targeted longer-term refinancing operations (TLTROs) in which euro area national central banks provided funding at favourable rates (as low as -1%) so long as commercial banks passed it on in the form of loans to non-financial businesses or non-mortgage lending to households. While foreign exchange intervention is less common today than it once was in most advanced economies, the Bank of Japan has recently intervened to support the yen, and interventions to weaken the Swiss franc characterise the Swiss National Bank's policy framework for most of the past decade.[12] Emergency funding for

---

8 The unique ability of the central bank to act as an LOLR or MMLR on an effectively unlimited scale is subject to some important qualifications that we discuss at the end of Section 3. It is also important to note that legislation limits the Eurosystem's ability to serve as an LOLR unless the funding is linked to emergency liquidity assistance (ELA).

9 In some countries, other public institutions can act as an LOLR independently or in coordination with the central bank. For example, the Swedish National Debt Office issued debt and lent to banks during the 2007-09 financial crisis.

10 See Cecchetti and Tucker (2021) for more details on the categorisation of central bank balance sheet operations.

11 Exceptions include cases where either the central bank rescues a (borderline) insolvent government by purchasing its debt or asset purchases as part of a coordinated monetary and fiscal stimulus.

12 Foreign exchange interventions differ from many of the other central bank financial stability policy tools. Operations viewed as stabilising by one country may be considered manipulative by another. For example, Switzerland was put on the US Treasury currency monitoring list in 2017 and designated as a currency manipulator in 2020.

governments through purchases in primary markets (or direct lending through overdraft facilities) is relatively rare in the advanced economies, but can occur, especially when markets are under extreme stress.[13]

The central bank is able to act as the enhanced LOLR and address funding illiquidity and (indirectly) market illiquidity by providing collateralised loans to eligible solvent firms or other collective vehicles (i.e., central counterparties) facing liquidity needs that cannot be met through the markets. When acting as an MMLR, the central bank addresses market illiquidity by committing to engage in outright purchases of temporarily illiquid financial instruments. Finally, central banks are increasingly involved in cross-border lending of last resort. This is done through a broad array of swap agreements among central banks. These include various networks, such as the Chiang Mai Initiative arrangement among eight Asian countries (including China, Japan and South Korea); the reciprocal arrangements of the European Central Bank, Federal Reserve, Bank of Japan, Bank of England, Bank of Canada and Swiss National Bank; and individual central bank facilities, such as the Federal Reserve's Foreign and International Monetary Authorities (FIMA) Repo Facility and the Eurosystem repo facility for central banks (EUREP).

In recent years and in response to severely adverse financial shocks, central banks enlarged the scope and scale of their lending operations. The traditional LOLR makes loans to banks and other intermediaries against a limited set of high-quality collateral. Today, a much wider range of collateral is accepted in enhanced LOLR operations and programmes that are designed to ensure credit flow to a range of non-bank financial institutions (NBFIs) and non-financial firms.[14] Furthermore, experience since the 2007-09 financial crisis shows that central banks' enhanced LOLR lending to impaired market makers may succeed in restoring their market making capacity, thus obviating the need for direct MMLR purchases. An early example of this is the Federal Reserve's Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF), which was created in September 2008 to finance US bank and bank holding company purchases of high-quality asset-backed commercial paper from money market mutual funds.

Some advanced economy central banks are now less hesitant to intervene directly in securities markets, purchasing both government debt instruments and a broad array of privately issued securities in an effort to stabilise prices and provide liquidity in markets they view as systemic. These interventions were on an ad hoc basis. Examples include the Bank of England's Corporate Bond Purchase Scheme (launched in August 2016, expanded in 2020 and expected to be fully unwound by the end of 2023); Sveriges Riksbank's corporate bond purchases (which began in September 2020 and was discontinued in December 2022); the Federal Reserve's Primary and Secondary Corporate Credit Facility (created in March 2020, with purchases of eligible assets ceasing at the end of 2020); and the Bank of Canada's Corporate Bond Purchase Program

[13] In many jurisdictions there are de jure and/or de facto legal restrictions associated with central banks operating directly in primary markets. For example, the Federal Reserve Act explicitly forbids the Federal Reserve from purchasing securities in primary markets. Similarly, the EU prohibition on monetary financing of governments bars the ECB and national central banks from direct purchases of debt instruments issued by central governments and public entities.

[14] In only a few instances do central banks lend to NBFIs or non-financial firms. It is more common to design programmes in which the central bank lends to banks with the proviso that the funds are then lent to non-banks. For a description of pre-pandemic counterparty and collateral policies at the Federal Reserve, Bank of England, European Central Bank and Bank of Japan, see Lee and Sarkar (2017).

(initiated in May 2020 and discontinued in May 2021).[15] Penalty terms for enhanced LOLR operations are standard practice for these facilities. Likewise, although some recent MMLR facilities involved pricing that appeared subsidised when compared with the prices available in the market at the time, the prices were likely below central banks' estimates of fundamental value (in a liquid and efficient market).[16]

In this report, we discuss the implications of using an enhanced LOLR or MMLR to address the build-up of systemic risk. We also examine whether there is an argument for formally establishing an enhanced LOLR or MMLR as permanent or standby facilities, even if they may be dormant most of the time. We are aware that establishing an enhanced LOLR or an MMLR is inevitably controversial.[17] A similar debate surrounds deposit insurance. Even in the face of strong evidence that deposit insurance effectively deters bank runs, those who weigh the costs of moral hazard more heavily remain unconvinced of the net stability gains.[18]

In the context of the enhanced LOLR and MMLR, moral hazard concerns would be a reason for only introducing these facilities on an ad hoc basis when needed (or not at all). This conclusion rests on a set of complementary concerns. First, explicit guarantees could encourage private agents (especially the least regulated ones) to take excessive risk. Second, promises to intervene in specific securities markets could distort prices, thereby reducing their information content. Third, expanding the established scope of central bank interventions could expose them to potential losses, undermine their independence and limit their ability to meet their primary inflation goals. A related argument against explicit commitment rests on the incentive value of constructive ambiguity.

As we argue in the next section, during the COVID-19 pandemic many central banks acted as enhanced LOLR and MMLR. So, even if an enhanced LOLR and an MMLR is not explicitly established as a permanent or standby facility, markets will expect policymakers to revive and use these arrangements, should the need arise.[19] Put slightly differently, given that in recent years central bankers did it once, and in some cases more than once, can they credibly commit to not intervening again? Furthermore, everyone knows that authorities will always be able to activate lending and market making facilities quickly. This creates an ad hoc structure, which means retaining most of the moral hazard costs while sacrificing the benefits of a thought-out, credible facility that reduces the likelihood and scale of any necessary interventions.

---

15 See Cecchetti and Schoenholtz (2022) for further details on each of these programmes. Descriptions of ECB policy responses to the March 2020 turmoil are referred to in de Guindos and Schnabel (2020a and 2020b).

16 In markets where buyers disappear, prices will inevitably be far from fundamental values. Whenever a central bank accepts a security as collateral for a loan or purchases the security outright, it must assess the market value of the security. In the case of the Eurosystem, Witt and Blaschke (2018) note that the Common Eurosystem Pricing Hub (**CEPH**) prices approximately 40,000 euro area securities each day. In the case of the Federal Reserve, valuating securities is sometimes outsourced to private firms. For example, BlackRock's Financial Markets Advisory served as the investment manager for the two corporate credit facilities during the pandemic. In addition, the Federal Reserve uses internal pricing models – similar risk pricing is also required for the Comprehensive Capital Analysis and Review (CCAR) for large banks.

17 A comprehensive cost-benefit analysis of central bank lending and market making is an important topic for future research.

18 For example, Demirgüc-Kunt and Kane (2002) conclude that explicit deposit insurance makes financial crises more likely.

19 As we note in Section 2, during the early days of the pandemic, the Federal Reserve revived many of the facilities developed during the 2007-09 financial crisis. These include the Commercial Paper Funding Facility (CPFF), the Primary Dealer Credit Facility (PDCF), the Money Market Mutual Fund Liquidity Facility (MMLF), and the central bank liquidity swaps.

With the benefit of hindsight and considering recent central bank actions, we proceed to examine some of the important questions these policy actions raise for the design and potential costs of an enhanced LOLR and an MMLR. Under what circumstances might we need them? When and where might interventions occur? Should they be needed, what drives the choice between lending to impaired market makers (indirect market making) and outright purchases (direct market making)? And, most importantly, is there a set of design principles that ensure the enhanced LOLR and MMLR are as effective as possible, while doing the least damage (i.e. minimising excessive risk taking and other forms of moral hazard, which could be boosted by enhanced private sector confidence in the public provision of funding liquidity and market liquidity)?

To anticipate some of our conclusions:

- The enhanced LOLR and the MMLR are public sector entities (or government-funded and government-guaranteed entities). Their aim is to ensure that systemic financial markets remain liquid so that there is a buyer for every seller at a price that is not dangerously far below estimates of the security's fundamental value. These public sector entities face difficult choices, including deciding which financial markets are systemically important, how to measure fundamental value and with which counterparties they should engage.

- Establishing an enhanced LOLR or MMLR creates moral hazard, encouraging excessive risk taking and distorting prices. Reducing risk-taking incentives and minimising the impact on prices requires striking a complex balance. The cost of borrowing from the enhanced LOLR or selling to the MMLR must be set so that it is unattractive in normal times, and only attractive in stress periods when compared with the expensive alternatives.

- To ensure credibility, it is essential that market participants believe that the enhanced LOLR and the MMLR can lend to qualified counterparties or purchase securities in unlimited amounts, offering a fixed rate or fixed price with full allotment.[20]

- In many instances authorities can achieve their market stabilisation objective either as an enhanced LOLR or as an MMLR. As an enhanced LOLR, they would lend (against collateral) to regulated private agents acting as market makers or to other regulated entities that would normally (under orderly market conditions) purchase the security. As an MMLR, either on their own balance sheet or on that of a captive entity created specifically for that purpose, they would stand ready to buy any quantity of a given security offered at a set price.

- Equivalence between the enhanced LOLR and the MMLR breaks down in several instances: (1) when concerns over the quality of the securities themselves cause the market to disappear; (2) when there is a coordination failure, causing individual dealers or market makers to fear that they will be left as the only participant on the buy side, amassing large inventories of a risky security in a volatile market; (3) when market makers face regulatory capital constraints that preclude them from purchasing and holding sufficient quantities of securities deemed systemic when market liquidity is threatened.[21] (4) when it becomes

[20] As we discuss further in Section 3, the elasticity of the central bank's balance sheet is restricted to assets and liabilities denominated in domestic currency. This may conflict with fixed exchange rate policies and compromise independence, should it lead to significant losses.

[21] If market makers exit because they are capital constrained, then relaxing capital requirements on affected intermediaries would be an alternative to direct central bank purchases.

impossible to establish the solvency of the potential borrowers, lending may not be an option – in each of these cases, providing funding liquidity to market makers, even at a subsidised rate, will not restore market function; (5) when counterparty arrangements are complex, making it difficult to identify who ultimately needs the funds; and (6) when setting up a lending facility may take too long to address the crisis at hand. The only option in these cases is for the MMLR to purchase outright and hold the securities, providing liquidity to the market to entice private purchasers to return.

Finally, we leave the development and application of the theoretical and empirical tools needed for a comprehensive cost-benefit analysis of both enhanced LOLR and MMLR facilities to future research. That said, in our view, central bank interventions to address market dysfunction should truly remain the last resort. Regulation and supervision are the first resort. Prudential authorities are there to ensure that financial institutions and financial markets are resilient, and that private institutions and market makers internalise the externalities of their actions. Accomplishing this necessitates rigorous capital and liquidity requirements, not just for banks and traditional financial intermediaries, but for private sector market makers as well.[22] It means haircut and margining practices designed to dampen, not amplify, shocks.[23] It means central clearing requirements that can both reduce spillovers from individual defaults and reduce liquidity needs when markets come under stress.[24] Furthermore, it means well-structured resolution regimes.[25] However, regardless of the adequacy of the regulatory and supervisory framework, regardless of how resilient financial institutions and markets may appear, there will always be the possibility of an adverse shock that is so severe that it puts the financial system at risk. That is, most people would agree that it is not possible to fashion a system that is resilient to the worst possible events (some of which no one can even imagine). It is in these cases – when there are miscalculations or the completely unexpected happens – that the central bank will be forced to step in. The purpose of this report is to explore how to design facilities that are the final line of defence in avoiding a collapse of the financial system.

In Section 2, we describe illustrative recent cases in which central banks enhanced the scope of their lending operations and purchased a broad range of securities directly – effectively acting as enhanced LOLR and MMLR during periods of severe market dysfunction. In Section 3 we turn to a discussion of the objectives, potential costs and structure of an enhanced LOLR and an MMLR. Section 4 describes the options for operational implementation of enhanced LOLR and MMLR policy interventions. This leads us to Section 5 where we propose a set of desirable attributes of an effective framework for stabilising financial markets. Section 6 concludes the report.

22 See Tarullo (2013) for a discussion of the role of capital and liquidity requirements in macroprudential regulation.

23 See Committee on the Global Financial System (2010) and European Systemic Risk Board (2020) for a discussion of the procyclicality of haircut and margining requirements.

24 See Duffie (2020) and Fleming and Keane (2021) on the potential benefits of clearing in US Treasury markets.

25 See Tucker (2014) for a summary of regulatory reforms over the 2009-2013 period and the essential role of resolution regimes.

2 Surveying the landscape

An important argument in favour of enhanced LOLR and MMLR facilities is that some securities markets are an important source of finance for banks, NBFIs and non-financial corporations, and play a critical role in the transmission of monetary policy.[26] This makes those securities markets a potential locus of instability that can spill over into the real economy, harming people's everyday lives and undermining the central bank's ability to meet its price stability or dual mandate. Furthermore, dysfunction in financial markets (and indeed in markets for real assets, including commodities and real estate) is unpredictable and now appears to be occurring more frequently.[27] For example, Liang (2020) argues that changes in the financial sector since the 2007-09 financial crisis increased the demand for liquidity by holders of corporate bonds beyond the ability of the markets to provide it in stress events.

In response to these developments, central banks engaged in a wide array of crisis-related interventions. Cantú et al. (2021) provide a comprehensive list of central bank policy responses across 40 jurisdictions in the period from March 2020 to March 2021.[28] They catalogue 527 interest rate changes, 59 adjustments in reserve requirements and reserve remuneration rates, 143 lending support actions, 101 actions related to exchange rate policy (including swap lines) and 54 asset purchase operations. Regarding the latter, 21 of 40 central banks purchased public assets and 13 purchased private assets, among them the Federal Reserve, the Eurosystem, the Bank of Japan, the Bank of England, the Bank of Canada and Sveriges Riksbank.

When a central bank engages in asset purchases, its objectives are not always transparent or straightforward. Two examples make the distinction clear. The first is the Eurosystem's Outright Monetary Transactions (OMTs), a programme under which the Eurosystem can make potentially open-ended secondary market purchases of short-term (maturity of between one and three years) euro area sovereign debt of countries adhering to the conditionality of an appropriate European Financial Stability Facility/European Stability Mechanism (EFSF/ESM) programme.[29] The stated purpose of the OMTs was "safeguarding an appropriate monetary policy transmission mechanism and the singleness of monetary policy".[30] In further explaining the rationale, then-ECB President Draghi noted the importance of ensuring that banks retained access to the euro area interbank market at interest rates that were not substantially different across euro area Member States.[31] All OMT purchases must be fully sterilised, as the OMT facility was not meant to be "unconventional monetary policy" to stimulate aggregate demand. Initiated in September 2012, purchases under this

---

26 For example, over the past two decades, the fraction of total financial assets accounted for by banks in the euro area has dropped from 63% to 41%. See the **Financial Stability Board** (2021).

27 A very recent example is the **Bank of England's gilt market operation** which was announced on 28 September 2022.

28 King et al. (2017) provides another list of central bank interventions.

29 The EFSM/ESM programmes include the possibility of EFSF/ESM primary market purchases of sovereign securities, something the Eurosystem itself is not allowed to do under Article 123 of the Treaty on the Functioning of the European Union.

30 See the webpage for more information about the **technical features of Outright Monetary Transactions**.

31 In his 15 November 2012 speech, Draghi states: "In a system that is working properly, there is a stable relationship between changes in the central bank's rates and the cost of bank loans for households and firms. Central banks can thus influence the overall economic situation and maintain price stability". He then goes on to note that it is essential that banks retain access to interbank markets and that "[i]nterest rates do not have to be identical across the euro area, but it is unacceptable if significant differences arise because of the fragmentation of capital markets".

programme have yet to be made. There is a broad consensus that the OMT programme succeeded by restoring confidence. This success was a consequence of the credible commitment to buy any amount that was offered, at the discretion of the ECB. Importantly, the success of OMTs means that a credible asset purchase facility does not need to make any actual purchases. The strict conditionality imposed on any Member State government making use of the facility minimises the moral hazard created by OMTs.

At the other end of the spectrum is the Bank of Japan's purchase of Tokyo Stock Price Index-linked exchange-traded funds (ETFs) and equities issued by Japanese Real estate investment trusts (J-REITs). Bank of Japan purchases began in December 2010 and, as of this writing, continue. Built up slowly over 11 years, current holdings total roughly JPY 37 trillion (approximately €250 billion). In making these purchases, the Bank of Japan initially aimed at reducing equity risk premia (as was the announcement of doubling the ETF purchase amount at the onset of the COVID-19 pandemic in March 2020). However, the ETF and J-REITs purchases continued even after financial markets stabilised, becoming a part of monetary stimulus policy with interest rates at the effective lower bound. There is evidence that the credible commitment to countercyclical ETF purchases was a cost-effective way of preventing equity risk premia from increasing during an economic downturn, even though the Bank of Japan reduced its actual emergency purchases.[32]

The ECB's pandemic-related asset purchase programmes are less easily categorised as they served more than one function.[33] The ECB's pandemic emergency purchase programme (PEPP) was announced in March 2020 and more than doubled in size (from €750 billion to €1,850 billion) in December 2020. This explicitly temporary programme was designed to provide flexibility to the existing QE asset purchase programme (APP), allowing it to aid in stabilising markets while helping to ensure medium-term price stability. In this way, the programme stabilised markets, so it had features resembling those of a classic MMLR.[34] Sometimes, the interventions needed to restore orderly markets can, in the very short term, appear to go against the central bank's pursuit of a price stability mandate. A recent example of this is the Bank of England's non-sterilised emergency purchases of gilts from 28 September to 14 October 2022. At the time, the Bank of England was engaged in progressively restrictive monetary policy to bring inflation back down to the target. Since financial stability is a precondition for price stability, the apparent contradiction disappears when the pursuit of price stability in the medium term is considered. The financial stability-oriented monetary expansion was temporary and reversible.

The ECB's series of 11 pandemic emergency longer-term refinancing operations (PELTROs) includes more examples of intervention policies with multiple objectives. PELTROs were designed during the pandemic to provide additional liquidity support to the euro area financial system and stabilise money market conditions. Table 1 outlines PELTROs and the other ECB liquidity-providing

---

32 Hattori and Yoshida (2021) provide a detailed discussion on this topic.

33 The Eurosystem is always careful to emphasise that the ultimate objective of its asset purchase programmes is to ensure the smooth functioning of the monetary policy transmission mechanism. The first step in this process is to guarantee that markets for governments and certain privately issued bonds function, with prices of the securities being adjusted in ways that allow policy to influence the real economy.

34 For more details on the dual role of the ECB's pandemic emergency purchase programme (PEPP), see Lane (2020a and 2020b).

operations that were implemented between 2014 and 2019,[35] providing different combinations of aggregate demand stimulus, targeting or steering credit to the corporate and public sectors, lending to banks and financial market liquidity support.[36]

Table 1

Categorisation of ECB lending and asset purchase facilities

	Monetary policy stance		Financial system stabilization			
Tool\Facility	AD Mgmt	Credit support	Funding liquidity	Market liquidity	Maximum size	Peak use
Main refinancing operations	✓		✓		Unlimited	€337 bn
Emergency liquidity assistance			✓		Unlimited	
Long-term refinancing operations	✓				Unlimited	
Targeted longer-term refinancing operations (I, II and III)	✓	✓	✓		Unlimited	€2,213 bn
Pandemic emergency longer-term refinancing operations		✓	✓		Unlimited	
Outright Monetary Transactions				✓	Unlimited	€0
Securities Markets Programme				✓	Unlimited	€209 bn
Covered bond purchase programme 1	✓	✓			€60 bn	€60 bn
Covered bond purchase programme 2	✓	✓			€40 bn	€16 bn
Covered bond purchase programme 3	✓	✓				€298 bn
Corporate sector purchase programme	✓	✓			€80 bn per month each	€312 bn
Asset-backed securities purchase programme	✓	✓		✓		€32 bn
Public sector purchase programme	✓			✓		€2,108 bn
Pandemic emergency purchase programme	✓			✓	€1,850 bn	€1,718 bn
Central bank liquidity swaps			✓		Varies, some unlimited	€3.7bn
Eurosystem repo facility for central banks			✓			

Sources: ECB and authors' judgement.
Notes: "AD Mgmt" is aggregate demand management. Since 2014, the Governing Council has recalibrated the net purchases of the APP on ***several occasions*** *(see* ***https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html****). Between April 2016 and March 2017, net purchases were targeted at €80 billion per month, distributed over the four open asset purchase programmes (covered bonds purchase programme 3, asset-backed securities purchase programme, public sector purchase programme and corporate sector purchase programme). Peak use is calculated based on outstanding amounts during the period over which the programme was active. The amount of emergency liquidity assistance is undisclosed, so we leave it blank. As the Eurosystem did not engage in foreign exchange intervention over the period of study, we omit that function. Last observation: July 2022.*

[35] These facilities include three-year longer-term refinancing operations (LTROs), targeted longer-term refinancing operations (TLTROs) and the asset purchase programme (APP), which includes the covered bond purchase programme (CBPP), the asset-backed securities purchase programme (ABSPP), the public sector purchase programme (PSPP) and the corporate sector purchase programme (CSPP). Lane (2020c) describes the analytical framework underlying these measures.

[36] We note that through its various programmes, the Eurosystem purchased large quantities of private bonds. As of early August 2022, it held 1,857 individual bonds from 407 issuers with a market value of €344 billion.

The Federal Reserve also introduced numerous facilities during the COVID-19 pandemic. These evolved over time, often initially serving one purpose before shifting to another. In March and April 2020, at the onset of the COVID-19 pandemic, the Federal Reserve revived seven facilities used during the 2007-09 financial crisis and put in place nine new ones. The facilities from the financial crisis included Treasury and mortgage-backed securities purchase programmes, a commercial paper lending facility, a money market mutual fund lending facility, a primary dealer lending facility, an asset-backed securities lending facility and central bank liquidity swap lines. New facilities included those for supporting municipal and corporate bonds, one providing backing for the Paycheck Protection Program, and a set of facilities aimed at supporting credit to small and medium-sized businesses (the Main Street Lending Facilities).

The stated justification for these facilities varied. Table 2 indicates that, similar to those of the ECB, some Federal Reserve facilities aimed to stabilise the domestic financial system, some provided emergency lending, some supported credit to specific types of firms and the purpose of other facilities was to provide aggregate demand stimulus. In many cases, a single programme served more than one goal. Sometimes these multiple objectives were simultaneous, and other times the facility was initially implemented with one aim in mind and subsequently used for another. Furthermore, transparency about the programmes' purposes varied.

Table 2

Categorisation of Federal Reserve lending and asset purchase facilities

Tool\Facility	Monetary policy stance		Financial system stabilization		Maximum size (USD)	Peak use (USD)
	AD Mgmt	Credit support	Funding liquidity	Market liquidity		
US Treasury securities purchases	✓	✓		✓	Unlimited	+3.5 tr
Mortgage-backed securities purchases	✓	✓		✓	Unlimited	+1.3 tr
Discount window and discount rate			✓		Unlimited	50.8 bn
Overnight Reverse Repo	✓				Unlimited	2.3 tr
Standing Repo	✓				Unlimited	275 bn
Term Deposit	✓				Unlimited	0
Commercial Paper Funding		✓		✓	Unlimited	4.2 bn
Primary Dealer Credit			✓		Unlimited	33.4 bn
Money Market Mutual Fund Liquidity			✓		Unlimited	53.2 bn
Primary Market Corporate Credit		✓		✓	850 bn	14.1 bn
Secondary Market Corporate Credit		✓		✓		
Term Asset-Backed Securities Loan		✓		✓	100 bn	4.1 bn
Paycheck Protection Program		✓			953 bn	88.4 bn
Municipal Liquidity		✓		✓	500 bn	6.4 bn
Main Street Lending Programs		✓	✓		600 bn	16.5 bn
Central bank liquidity swaps			✓			446.1 bn
Foreign and International Monetary Authorities Repo			✓		3.6 tr	1.4 bn

Sources: Board of Governors of the Federal Reserve System: H.4.1 release and authors' judgement.
Notes: "AD Mgmt" is aggregate demand management. Peak use for US Treasury and mortgage-backed securities is the cumulative change from 1 January 2020 to 30 June 2022. The Overnight Reverse Repo current maximum amount was on 30 June 2022. Maximum size of central bank liquidity swaps is effectively unlimited. Maximum size of the Foreign and International Monetary Authorities (FIMA) Repo Facility is the total quantity of US Treasury securities held in custody at the New York Federal Reserve Bank. Because the Federal Reserve did not engage in foreign exchange intervention over the period of study, we omit that function.
Last observation: 30 June 2022.

The Federal Reserve's purchases of US Treasury securities that began in March 2020 are an example of shifting objectives. Initially, these were aimed at steadying a crucial market during the financial stress precipitated by the extreme uncertainty during the first stages of the COVID-19 pandemic. Over a five-week period, the Federal Reserve purchased USD 1 trillion in US Treasury securities. Nearly everyone would classify this as an MMLR operation aimed at stemming a market run that quickly restored market function.[37] Then the operation continued. That is, once markets were functioning normally, the MMLR operation quickly transformed into one aimed at stimulating aggregate demand.

[37] The Federal Open Market Committee statement announcing this programme explicitly states that it is to "support the smooth functioning of markets for Treasury securities". See Federal Open Market Committee (2020).

Another example of a facility with multiple objectives is the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF), which appears to have been both an MMLR operation and a credit support operation. In its capacity as an MMLR the Federal Reserve's objective was to provide sufficient market liquidity to allow for the redemption of ETFs tracking corporate bonds. However, by ensuring the ability to sell corporate bonds in the secondary markets at a price close to fundamental value, the facility encouraged the issuance of new bonds. In this way, an operation intended to support the secondary market also facilitated funding through new issuance in the primary market. Furthermore, as Gilchrist et al. (2020) show, and as may be the case more widely for MMLR operations, corporate bond markets returned to normal (or close to normal) upon the announcement of the programme. In other words, it is far from clear that the Federal Reserve needed to purchase any corporate bonds or ETFs tracking corporate bonds at all. While the total quantity purchased only reached USD 14.1 billion, the Federal Reserve did eventually amass a portfolio of 1,291 individual corporate bonds from 500 private sector issuers, as well as shares of 16 different corporate bond ETFs.

Before continuing, we note the contrast between those facilities directed at stabilising corporate bond markets and those intended to address the funding constraints of either money market funds (MMFs) or primary dealers. While the former clearly have an MMLR element, the latter may not. Instead, these look like enhanced LOLR facilities. To see why, consider the Federal Reserve's Money Market Mutual Fund Liquidity Facility (MMLF). It is well known that MMFs' bank-like structure makes them prone to runs.[38] However, because they are not chartered banks, they do not have direct access to Federal Reserve lending facilities, nor do they benefit from an arrangement akin to deposit insurance. To provide support, the Federal Reserve created a mechanism whereby chartered banks can obtain collateralised loans from the Federal Reserve secured by assets they purchase from MMFs that faced redemptions.[39] We view this as an enhanced LOLR operation, not an MMLR operation.

The Federal Reserve's facilities have two properties. First, most of them have an expiry date.[40] Whether these time limits are appropriate is a matter for debate. Timely availability argues for facilities that are permanent but dormant when there is adequate market liquidity. Controlling moral hazard is a reason for restricting loans or purchases to periods of acute market distress. In the case of the United States, however, the law requires expiration of facilities other than those that lend to chartered depositories (conventional discount lending) or that purchase securities that are fully guaranteed by the Federal Government. Second, to separate the MMLR operations from quantitative easing aimed at stimulating aggregate demand, it is natural to expect sterilisation of MMLR operations where possible. In addition, the central bank should sell any assets acquired through MMLR purchases as expeditiously as possible and with minimal impact on the market prices of the securities it is selling.[41]

---

38 See European Systemic Risk Board (2021).

39 Since the passage of the Dodd-Frank Act in 2010, lending directly to MMFs requires the approval of the Secretary of the Treasury, complete with explicit fiscal indemnification and an expiration date.

40 While the standing facilities for US dollars and other foreign currency swap lines between the Federal Reserve, the Bank of England, the ECB, the Bank of Japan, the Swiss National Bank and the Bank of Canada may appear to be an exception, they are not. They are authorised by the Federal Open Market Committee which is dissolved and reconstituted every January. As a result, the swap lines need to be reauthorised on an annual basis.

41 As was the case with the Federal Reserve's massive purchases of US Treasury securities in spring 2020, the scale of MMLR operations may be such that sterilisation is not feasible.

3 Objectives and potential costs

When acting as enhanced lenders of last resort and market makers of last resort, the central bank has three possible, but interrelated objectives. One is to restore the normal flow of credit to financial and non-financial corporates, households and (sometimes to) the government. This involves the LOLR making collateralised loans to eligible counterparties and the MMLR purchasing financial instruments outright in the secondary (and possibly primary) markets. The second objective is to restore the normal functioning of systemically important financial markets by enabling sellers to find buyers in the secondary markets at prices that reflect the fundamental value of their assets.[42] This can either be pursued through collateralised loans to market makers – or other normal purchasers of the securities – who are illiquid, or through outright asset purchases. The third objective is to restore the normal functioning of the monetary transmission mechanism, which is impaired when funding or market liquidity vanish.

To ensure stability of the domestic financial system during periods of heightened stress, the central bank must ensure both the funding liquidity of key financial institutions (including market makers), and the market liquidity of systemically important financial instruments. The two forms of liquidity are related and can disappear simultaneously. When it comes to domestic currency financial instruments, the pockets of the central bank are always deep enough to fulfil both tasks. The key design challenge is to minimise moral hazard. This means discouraging excessive risk taking by counterparties and issuers of financial instruments who know that the central bank is ready and able to rescue them should funding or market liquidity evaporate. Moral hazard can lead economic agents to take on additional risk, reducing resilience and increasing the probability of a central bank intervention. It also distorts prices, reducing the allocative efficiency of capital markets.[43] Another challenge is to ensure that the price stability mandate of the central bank is not threatened by the pursuit of LOLR lending operations and MMLR asset purchases. Sterilisation of the lending and asset purchases is a way of minimising this risk.

An inherent feature of financial intermediation is that the balance sheets of most financial entities, as well as many households and non-financial corporates, exhibit leverage and significant mismatches in liquidity, duration, currency denomination and other payoff-relevant characteristics. As a result, these entities are all at risk if they lose access to sources of funding, to securities markets where they can liquidate their assets, or both. This means that unwarranted defaults, debt repudiations, insolvencies and bankruptcies are an ever-present risk. In addition, the precautionary and defensive measures taken to ensure financial survival, such as cutbacks in consumption and investment spending, can have serious adverse consequences for the real economy.

Clearly, microprudential and macroprudential regulations are the first line of defence. The combination of capital buffers, leverage ratios, liquidity requirements, restrictions on the types of assets and liabilities a financial institution can hold or issue, borrower-based measures, and the like is designed to reduce the probability and severity of financial crises. However, a meaningful and economically desirable depth and intensity of financial intermediation will always entail significant

[42] We discuss valuation in Section 4.1.

[43] See, for example, Cieslak and Vissing-Jorgensen (2021).

leverage and asset-liability mismatches. This means that the sudden vanishing of funding liquidity, market liquidity, or both is a material risk for which the authorities must always be prepared. The event that triggers a financial crisis can be exogenous, like the COVID-19 pandemic, or endogenous – such as a self-fulfilling, fear- or panic-driven flight to quality – or a combination of both.

Over the years, authorities developed frameworks for ensuring that commercial banks remain liquid during financial crises.[44] The combination of government-backed deposit insurance and a central bank LOLR is designed to stem runs and prevent fire sales. The traditional LOLR specifies eligible counterparties, the nature and value of eligible collateral, whether the loan is recourse or not, and the terms (such as the lending rate, duration and haircuts). To discourage excessive risk taking by the LOLR counterparties, they are subject to rigorous regulation and supervision, while the terms of the loans are unattractive, i.e., on penalty terms. If the LOLR is a standing facility, it is always available, willing to provide immediate loans in whatever size needed, provided the borrowers can provide the collateral and meet the (penalty) terms. As such, loans are offered at a "fixed rate with full allotment". If central banks do otherwise and limit the volume of the loans, there would be times when lending might be insufficient to calm disorderly credit markets.

As the sources of credit to the real economy shift away from banks and toward NBFIs and capital markets, maintaining financial stability may require central banks to adapt their toolkit. The experience described in Section 2 leads us to focus on two types of facilities that central banks used in the past and may choose to use again: enhancing the function of the LOLR and performing direct market interventions through an MMLR.

Starting with the LOLR, there are arguments for expanding counterparty and collateral eligibility. First, the potential systemic importance of institutions that engage in bank-like activities, regardless of whether they are chartered banks, is a reason for allowing the central bank to extend the list of eligible counterparties to non-bank intermediaries. Examples include stable net asset value MMFs that issue callable liabilities, and insurance companies engaging in securities lending. Meeting the solvency requirement for borrowing implies that the LOLR will need access to current information on the health of the potential borrower. This requires rigorous and timely supervision. Second, some central banks may need to broaden the list of eligible collateral to account for the ever-expanding list of financial instruments banks and NBFIs hold in their portfolios.

Turning to markets, as we emphasise in Section 2, in recent years central banks purchased a wide range of privately issued and government securities outright for the purpose of stabilising financial markets deemed systemic. Illiquid securities markets can impede the flow of credit to the real economy by restricting primary market access of would-be non-financial corporate bond issuers. Secondary markets can become disorderly, with large bid-ask spreads, widening credit spreads, exaggerated sensitivity of prices to even small sell orders, excessive volatility of prices in response to changes in sentiment, and violations of no-arbitrage conditions. There can be fire sales of illiquid financial instruments at prices far below any reasonable estimate of fundamental values, and market activity can disappear altogether. Regardless of the cause, large price declines can spill over to other securities markets and institutions, with the potential to precipitate the failure of

[44] For example, Basel III introduced two liquidity ratios: the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR) that can each individually bind.

otherwise solvent entities. Market illiquidity can also contribute to funding illiquidity, as both bank and non-bank lenders faced with valuation losses could decide to withdraw credit supply. An adverse liquidity spiral can develop in which market illiquidity creates funding illiquidity, which then leads to further market illiquidity. These adverse dynamics can lead to a broad-based contraction in credit to the real economy.

When systemically important financial markets become disorderly over days or weeks, authorities need to look for ways of prompting private intermediaries to resume their normal role. This is where the enhanced LOLR comes in. However, as we noted earlier, there are circumstances in which central bank funding (subsidised relative to the cost of funds in disorderly markets, but on penalty terms relative to the cost in orderly ones) may not be sufficient to entice dealers and markets makers to resume their traditional roles. One such case is when market participants question the quality of the instruments themselves. In the language of Holmström (2015) and Dang et al. (2019), the information sensitivity of the securities could suddenly increase, creating adverse selection. A second instance involves a coordination failure. Individual dealers and market makers may fear that everyone else will exit, so a single institution ends up holding huge inventories in volatile markets. A third possibility is that intermediaries may be capital constrained. If, as is often the case, the market maker is a subsidiary of a bank holding company, then leverage ratio requirements (or internal risk management limits) may make it costly or even impossible to borrow from the central bank and purchase securities. Yet another case occurs when it is impossible to establish the solvency of potential borrowers. A fifth case is when the complexity of private counterparty arrangements makes it difficult to identify who would ultimately benefit from the funds and be able to make the market. And finally, if time is of the essence, there is the possibility that setting up a lending facility would take too long.

Under any of these circumstances, the central bank (or its agent) may choose to take on the role of MMLR, buying distressed financial instruments outright. In the secondary markets, this will involve the MMLR acting as a price maker and quantity taker, setting a price at which it is willing to purchase any amount offered by any counterparty that can reliably deliver the securities. We would label this as a "fixed price full allotment". A permanent MMLR facility would just duplicate market pricing in normal times, albeit on penalty terms. Only when financial markets are illiquid, and the market pricing mechanism is impaired, would the MMLR facility's prices substitute for market pricing. Finally, if an intervention in the primary issuance market is deemed desirable, the central bank would again purchase any amount the issuer offers at the set price.

When considering interventions to support financial markets, either through lending or direct purchases, central banks will need to determine the eligibility of both the instruments (including currency of denomination) and the counterparties. On the instruments themselves, during the COVID-19 pandemic, central banks purchased a wide range of fixed-income securities. These included government bonds, financial and non-financial corporate bonds, other debt instruments, including obligations of MMFs and other investment funds, such as residential and commercial mortgage-backed securities. Furthermore, as noted earlier, the Federal Reserve's pandemic facility (the SMCCF) bought corporate bond-based ETFs.[45]

[45] Section 14 of the Federal Reserve Act prohibits the purchase of equity.

The case for intervening in equity markets directly is less clear-cut. There are, however, examples. The most prominent example is the case of the Hong Kong Monetary Authority (HKMA). During the 1997-98 Asian financial crisis, Hong Kong's US dollar currency board came under attack. Speculators took short positions in the Hong Kong stock and stock futures markets, exchanging the proceeds for US dollars and causing an outflow from the Hong Kong Monetary Authority (HKMA). This in turn reduced the monetary base, driving up interest rates in Hong Kong. Surging interest rates resulted in a further decline in equity values, creating profits for the short sellers. To break this cycle, the HKMA intervened, purchasing HKD 118 billion in equities over a two-week period in late August 1998. This amounted to roughly 8% of the capitalisation of the Hong Kong stock market at the time. The HKMA started selling their holdings just over a year later, and by all accounts made a substantial profit on the transaction.[46]

Finally, there have been recent calls for emergency intervention in the nickel futures market[47] and the energy markets. Central banks have not typically intervened in commodity markets, whether directly through outright purchases of commodities in the spot market, through commodities futures and other derivative contracts, including contracts for differences, or by acting as LOLR to the market markers (the commodity trading houses). In our view, directly lending to individual industrial companies or sectors that may be insolvent, regardless of their importance for the economy, is best left to fiscal authorities.[48]

Another important issue is the currency denomination of the LOLR loans or of the debt instruments that are purchased by the MMLR. The depth of the central bank's pockets is clearly limited when it comes to lending in foreign currency or interventions in foreign currency denominated financial instruments. Therefore, the central bank may have to borrow in foreign currency because its gold and foreign exchange reserves are limited. For central banks in heavily dollarised emerging and developing economies, this materially diminishes the likelihood of effective interventions.[49]

While there may be different views on the exact instruments and markets that the central bank might support, the choice of counterparties appears to be less controversial. For the enhanced LOLR, the central bank must be able to determine the solvency of the borrower, to whom the central bank will have recourse should the collateral default. This means restricting access to regulated entities about whom the central bank can obtain detailed up-to-date supervisory information.

By contrast, the MMLR does not need to know the identity or the financial soundness of the seller so long as there is sufficient confidence that the transaction will settle. Settlement risk can be minimised by proper sequential structuring of transactions, for example, delivery versus payment.

---

46 For descriptions of this episode in varying degrees of detail, see Fu (2001), Liew and Wu (2002) and Goodhart and Dai (2003).

47 On 8 March 2022 nickel prices spiked 250% on the London Metal Exchange, leading to calls for central bank action. Instead, the London Metal Exchange suspended nickel trading for one week and cancelled USD 3.9 billion in trades, returning the market to the 7 March closing price.

48 We note the recent actions by the Bank of England on behalf of the UK Treasury through the **Energy Markets Financing Scheme**. This is a guarantee scheme designed to encourage banks to lend to energy companies. Given that there is full indemnification – the Treasury assumes all risks – we view this as a fiscal guarantee, not primarily a central bank lending programme.

49 See, for example, Bennett et al. (1999).

Furthermore, restricting MMLR counterparty eligibility could leave those not included unable to trade, thereby undermining the ability of the facility to meet its ultimate objective.

Before closing this section, we would like to offer additional remarks about moral hazard and about some limitations that central banks face. As we noted earlier, the presence of an enhanced LOLR, an MMLR, or both, creates moral hazard and reduces private incentives to ensure that financial markets remain liquid. In other words, if central banks are expected to intervene, financial intermediaries and financial market participants will hold riskier, less liquid and less resilient balance sheets. To some extent, microprudential supervision could play an important role in addressing this added impetus toward riskier, less liquid, and less resilient balance sheets. However, as past experience has taught us, faced with the possibility of a financial meltdown, authorities will act decisively to restore orderly market function as soon as possible. It is therefore essential that a rigorous regulatory and supervisory framework is in place for financial markets and institutions deemed systemically important, and also that the enhanced LOLR and MMLR adopt pricing schemes that minimise distortions and discourage moral hazard.

Furthermore, the unique ability of the central bank to act as LOLR and MMLR on an effectively unlimited scale is subject to several important qualifications – some of which are evident in the experience summarised in Section 2. First, it applies to interventions in domestic currency denominated financial instruments only. The “elasticity” of the central bank’s balance sheet reflects its ability to create domestic base money at will. It cannot create foreign currency legal tender. This can materially limit the ability of emerging market and developing economy central banks to act as LOLR or MMLR in heavily dollarised or euroised financial and economic systems. Second, a central bank managing a fixed exchange rate regime (or a currency board) may be subject to market constraints on its ability to act as a domestic currency LOLR or MMLR for fear of triggering a run on the currency peg. Also, the concern remains that the central bank will suffer losses on its exposures to collateralised loans or outright purchases of financial instruments. Careful verification of the quality of the collateral and of the creditworthiness of its counterparties can reduce but not eliminate this risk for the LOLR. Furthermore, while the MMLR too can minimise settlement risk, market risk and underlying quality risk associated with the securities it purchases, it cannot avoid such risks altogether.

Related to this final point, authorities are clearly concerned that acting as an enhanced LOLR or an MMLR could put a central bank’s solvency at risk. In the event of substantial losses, a forced monetisation would undermine the central bank’s price stability mandate. This is an important argument against using these facilities. One way of avoiding the threat of monetisation is for the fiscal authority to provide a backstop for central bank losses incurred in its capacity as an enhanced LOLR and an MMLR. Another approach would be to give the operational responsibility of acting as an MMLR (and even as an enhanced LOLR) to an entity other than the central bank. In this scenario, however, such an entity would still need unrestricted access to the resources of the central bank and the fiscal authority to be effective. This set of issues is particularly relevant in the euro area, where there is a division of authority and of financial and fiscal responsibilities between the ECB, the national central banks and the national fiscal authorities.

4 Designing the framework: the enhanced LOLR and the MMLR

At an operational level, the ideal framework for stabilising financial markets is composed of a facility, or set of facilities, that catalyses the resumption of market making by private agents as soon as practically possible and with the smallest possible adverse impact on incentives. As we emphasise throughout, this can either be done by lending to impaired, but solvent, market makers (or other eligible counterparties) to allow them to resume their market making activities or return to their normal purchases, or by offering to purchase securities directly. In the latter case, central banks would not have a permanent presence in the market. They are not continuously buying and selling, maintaining an inventory of securities they are holding to always make markets. Instead, the facility will only be active when needed, engaging in purchases in a financial emergency when market liquidity has vanished or threatens to do so.[50]

Before continuing, note that whether a market disappears is a matter of interpretation. There is nearly always a buyer at some price, albeit one that could be very low.[51] The concern is to avoid sudden price drops in which prices fall far below any reasonable estimate of fundamental value. Such precipitous declines in value can bring on widespread insolvencies, damaging the financial system, impairing the monetary policy transmission mechanism and the flow of credit to the real economy.

4.1 General considerations

For a central bank to construct a facility to stabilise financial markets, the operational objective must be to catalyse market making where it has ceased to function. Understanding why markets disappeared in the first place is therefore paramount, and there are three possible reasons: (i) private sector market makers withdraw, (ii) typical market participants on the buy side disappear, or (iii) private investors question the quality of the security. Starting with the first, market makers generally stand ready to buy and sell securities, providing bids and offers, maintaining order books to allow institutions and individuals to trade. Serving this function, ensuring the smooth operation of a financial market, requires private sector market makers to hold inventories of securities. Importantly, the less frequently a security trades, the more time there is between typical customer orders, and the longer a market maker may be required to hold a particular item in its inventory.[52] This creates the need for funding and the risk of price movements. The more expensive or more difficult it is to obtain funding, and the more volatile the price, the more costly and risky it will be for

[50] On occasion, when individual markets became disorderly, participants have asked for central bank intervention. One recent example is the case of the London Metal Exchange when nickel prices surged on 8 March 2022. As this was not a symptom of wider financial distress, nor was the nickel market itself systemic, policymakers ignored these calls. In our view this was the correct decision.

[51] Allowing for the possibility of negative prices implies that there is always a buyer.

[52] There are millions of individual bond issues, most of which virtually never trade. That is, outside of equities, there are only a few bonds for which there is any turnover.

the market maker to play its role. As those costs and risks rise, or attitudes toward existing risks change, the market maker might choose to exit for a time.[53]

Market participants (other than the market maker) are the institutions and investors that submit orders to buy and sell securities. Should buyers exit, the market will cease to function. Like the market makers, would-be buyers require financing. And, like market makers, they are likely wary of price volatility. Therefore, a combination of increases in funding cost and perceived market risk can push these participants to the sidelines.

Finally, concerns may develop about the securities themselves. There is always imperfect knowledge about the financial condition of the issuer of a financial instrument. We have various mechanisms for managing this opacity so that we can reassure investors and encourage them to hold the securities, at least most of the time. However, if there are concerns regarding the underlying instrument's quality or the creditworthiness of the issuer, buyers may disappear.

Crucially, these three elements are connected. Concerns about the quality of a security or its future market liquidity can result in an increase in the cost of funding as terms of loans and repurchase agreements change. Increases in risk perception or risk aversion can be pervasive, driving out both the market makers and the other market participants, especially prospective purchasers. And in response to concerns that it might become difficult to sell a security – and a rush to sell could turn into a market run – there may well be increasing investor reluctance to purchase a particular instrument in the first place.

These interactions mean that a central bank that does not share market participants' perceptions of risk or concern about quality of the securities could succeed in restoring market order by addressing the sources of dysfunction. How might the authorities do this? There are two possible mechanisms. In the first, the central bank uses its capacity as a lender to provide collateralised financing to private intermediaries to allow them to purchase and hold the securities.[54] In the second, authorities purchase securities directly, holding them on their own balance sheet or on the balance sheet of a captive entity created solely for that purpose.

If the central bank shares concerns about the quality of securities and sees the evaporation of market liquidity as justified, prudence dictates that a liquidity facility should not be activated. That is, in such a case, authorities should refrain from introducing a subsidy. Instead, they should allow market forces to operate so that prices adjust in a manner that reflects embedded risks. The government may play a role in the orderly resolution of any resulting defaults and insolvencies, but this is not the province of the enhanced LOLR or MMLR.

Before continuing, we should mention the issue of pricing. Valuation is a critical aspect of any LOLR or MMLR regime. In both cases, it is essential that central banks have the capacity to value illiquid instruments. A number of central banks have systems in place for valuing fixed-income securities. The Eurosystem's Common Eurosystem Pricing Hub (**CEPH**) prices approximately

---

[53] To meet its objectives, the MMLR must be tailored to the structure of the financial markets in which it intervenes. Moreover, financial microstructure and the character of market makers can shift, and the MMLR will need to take this into account. For example, in recent years, traditional market makers such as large investment banks withdrew (at least in part) and were replaced by new institutions, such as high-frequency traders.

[54] The question of whether these loans should be with or without recourse is a complex one that we leave up to debate.

40,000 euro area securities on a daily basis.[55] As a part of the annual Comprehensive Capital Analysis and Review (CCAR), the Federal Reserve provides risk prices for a broad array of assets.[56] The Bank of England also developed a framework for pricing bonds that it considers purchasing. Overall, our conclusion is that the central bank must always have a view on appropriate values in normal times for any security (or basket of securities) that it would consider taking as collateral for a loan or purchasing outright during episodes of funding and market illiquidity.

Beyond determining the underlying fundamental values, it is important that the LOLR or MMLR have the capacity to manage the associated risks. For the LOLR, one possibility is to insist on prepositioning of collateral. Prepositioning means that potential borrowers post eligible securities in advance and the central bank then has time to determine the collateral's value and assign a haircut. For the MMLR, beyond updating pricing as frequently as possible, it means ensuring appropriate risk management of the facility, including selling the assets when the episode of market illiquidity ends.[57]

4.2 The enhanced lender of last resort

In his original conception of what we now call the LOLR, Bagehot (1873) wrote that the central bank should "lend to merchants, to minor bankers, to 'this man and that man', whenever the security is good".[58] No central bank has ever followed this dictum exactly. Current practice is to provide collateralised loans to a limited number of solvent financial institutions at a penalty rate. To reduce the risk of insolvency of its counterparty, the central bank only allows regulated and supervised institutions (normally depository banks) to borrow.[59] But in Bagehot's original view, lending should be to almost anyone.[60] Enhancing the LOLR with a view to ensuring financial market functioning is surely possible.

Several of the Federal Reserve's facilities listed in Table 2 are examples of an enhanced LOLR: the Primary Dealer Credit Facility (PDCF) and the central bank liquidity swaps. In place from March 2008 to February 2010, and again from March 2020 to March 2021, the PDCF provided collateralised loans to primary dealers to allow them to finance their securities portfolios.[61] Primary dealers are the trading counterparties of the Federal Reserve in their open market operations. Some are banks, but not all. To ensure that it could fulfil its role in monetary policy operations, and in particular provide liquidity to the US Treasury market, the Federal Reserve needed to provide a mechanism for short-term lending similar to that available to banks. As the Federal Reserve stated

55 See Witt and Blaschke (2018).

56 See **Comprehensive Capital Analysis and Review 2022 - Related Data**.

57 Diversification may be helpful here. It is typically cheaper to trade baskets of securities than to trade individual elements of a basket one at a time, assuming the basket is well diversified, as this reduces idiosyncratic risk for both buyer and seller.

58 See Bagehot (1873), p. 25.

59 See Tucker (2009).

60 Article 13(3) of the Federal Reserve Act does come close to the Bagehot formulation as it provides for lending to individuals, partnerships and corporations. In its most recent formulation, the only stipulation is that the lending be through a "program or facility with broad-based eligibility", where the term "broad-based" is defined to mean a minimum of five entities.

61 In the 2008-2010 facility, collateral was restricted to investment-grade bonds. In the 2020-21 version, the list of eligible collateral was significantly broader, including commercial paper, municipal securities and equity, among others. Usage fluctuated, with the original facility peaking at USD 146 billion in early October 2008, and the pandemic version peaking with lending of USD 33 billion in mid-April 2020.

in its announcement, the ultimate purpose of the PDCF was to "promote the orderly functioning of financial markets more generally".[62]

Central bank liquidity swaps are also a form of enhanced LOLR action, albeit somewhat more complex. When domestic financial intermediaries purchase foreign securities, they typically need foreign currency funding. European banks holding US dollar denominated bonds and commercial paper typically need to finance them with US dollar liabilities. Should these European institutions lose access to US dollar funding, they may be forced to sell their US dollar assets. To avoid fire sales by foreign intermediaries into their domestic securities markets, central banks created a network of liquidity swaps, the most important of which is operated by the Federal Reserve. Through its central bank liquidity swap facility, the Federal Reserve lends US dollars to the foreign central banks (effectively accepting the foreign central bank's currency as collateral), which will lend them to those commercial banks and other eligible financial institutions in their jurisdictions that required US dollar funding.

While the Federal Reserve's swap lines existed for decades, they have grown in importance from late 2007. At their peak, 14 central banks had reciprocal arrangements with the Federal Reserve, and in mid-December 2008 borrowed a total of nearly USD 600 billion. The maximum outstanding during the COVID-19 pandemic was USD 450 billion. Many of these temporary swap arrangements were re-established at the start of the COVID-19 pandemic, together with the FIMA repurchase agreement facility which allows temporary exchanges of US Treasuries held in custody at the Federal Reserve Bank of New York for US dollars.[63] The Eurosystem operates a similar arrangement with its EUREP facility.

Even within the monetary policy framework, certain central bank actions can steer interest rates and provide lending support. For example, in the Eurosystem, the public list of collateral eligible for posting in the main refinancing operations includes over 25,000 securities in 134 separate haircut categories, ranging from 0.4% to 44.6%.[64] In response to tension in financial markets, in October 2008 the Eurosystem shifted to a fixed rate full allotment policy for the weekly main refinancing operations. [65] Since then, banks wishing to finance their securities portfolio can obtain as much funding as they wish (up to the limit indicated by the available collateral and the haircuts) at the policy rate in place. This has two immediate benefits. First, it means that a bank facing private funding withdrawals does not need to sell securities. Second, it means that a bank is more willing to

---

62 See **Federal Reserve System - Primary Dealer Credit Facility**.

63 At the time of writing this report, the Federal Reserve holds nearly USD 3.5 trillion in securities in custody for foreign central banks and international institutions. The FIMA facility has a **per counterparty daily limit of USD 60 billion**.

64 The **ECB's list of eligible collateral** for lending operations changes daily. Haircuts depend on the issuer, the residual maturity, whether the coupon is floating or fixed, whether the asset is marketable and whether the asset is in two broad ratings categories. As a result, changes in the haircut on an individual asset occur only because of ratings transitions across the A-/BBB+ or BBB-/BB+ thresholds, not based on an internal judgement about credit quality. This means that changes are infrequent. Furthermore, as we have noted several times, through its Common Eurosystem Pricing Hub (**CEPH**), the Eurosystem produces daily prices for tens of thousands of securities.

65 In his 14 October 2008 speech, then-ECB President Jean-Claude Trichet described the rationale for both the fixed rate full allotment policy and the broadening of eligible collateral. On the former, he stated: "On 8 October, due to intensified tensions in the financial market, the ECB took the absolutely exceptional decision to adopt a fixed rate tender procedure with full allotment for all its weekly main refinancing operations as long as market conditions dictate". On the latter, Trichet noted that accepting a wide range of collateral "facilitated the raising of liquidity via the Eurosystem for banks with reduced access to the interbank market". See Trichet (2008).

purchase an eligible security, should the price become sufficiently attractive.[66] Both reduce downward pressure on prices, making it less likely that euro area securities markets will become illiquid.[67]

These cases illustrate how an enhanced LOLR can stabilise financial markets. However, the details could lead to several issues: to whom and on what terms should the central bank be willing to lend? The counterparty list should be restricted to regulated and supervised entities, in order to ensure some official (or at least credible) certification of their solvency. This requirement minimises the credit risk of the enhanced LOLR. It does not, however, address moral hazard, which instead is reduced by the combination of rigorous regulation and supervision and making the loans available on suitably severe penalty terms. But beyond the broad limitation to regulated and supervised entities, a facility could be open to brokers, dealers, asset managers, MMFs, pension funds, insurance companies, finance companies and certain types of investment companies, including hedge funds. Importantly, the list of eligible counterparties – those that would be allowed to borrow if the facility is open – must always be current.

Turning to the terms, central banks try to control their credit risk, so we would expect lending to be over-collateralised.[68] As for collateral eligibility, since the purpose of the facility is to ensure liquidity in specific securities markets, one possibility is to limit collateral to the securities in the target market. For example, if the objective is to address stress in the market for investment-grade corporate bonds, the central bank could restrict the list of bonds against which it will lend. Determining the lending rate involves a complex choice. Bagehot's original recommendation to lend at penalty rates is an established approach for controlling moral hazard and providing the appropriate incentives for liquidity risk management at individual institutions. When authorities' objective is to encourage investors and market makers to re-engage to mitigate a financial catastrophe, Bagehot prescription implies that the lending rate should be set below the one available in disorderly markets, but above an estimate of what would prevail in markets in normal times. The conclusion is that either the enhanced LOLR operates as a standing facility with a rate that is unattractive when markets are orderly, or it lies dormant during normal times with a mechanism for activation, should the need occur.

Finally, we should say a word about exit. Lending facilities can cease operation if borrowers stop borrowing or if lenders stop lending. Since loans from the facility are on penalty terms with rates above what would prevail in normal times, as markets and the financial system stabilise it is natural to expect borrowers to find private lenders willing to provide funds at rates below those of the central bank's LOLR facility. So, while policymakers may choose to close the facility and call in outstanding loans, the straightforward way to exit from enhanced LOLR operations is to simply wait for demand to disappear. Then the facility can be shut down for new business or kept open, albeit on terms that are no longer attractive to private borrowers – until the next liquidity crisis hits.

---

66 We note that while the Eurosystem states that the framework includes *marketable assets*, as discussed in Bindseil et al. (2017) (p. 58, Table 7), only a small percentage is traded.

67 For more information on central bank collateral frameworks, see Nyborg (2017).

68 The combination of overcollateralisation and the certification of solvency makes it unlikely that the central bank would suffer a loss in its lending operations. Nevertheless, if the borrower becomes insolvent and the collateral is insufficient to recover the full amount of the loan, there is the question of the central bank's status in the bankruptcy proceedings. We leave this issue for others to consider.

4.3 The market maker of last resort

When acting as an MMLR, the central bank purchases securities directly, confronting market illiquidity head on. Rather than encouraging private agents to resume their traditional roles, the MMLR takes the place of the market maker, offering to purchase in a manner designed to keep prices from crashing and prevent markets seizing up or ceasing to function completely. Applying Bagehot's institution-based prescription to financial markets helps us to see how this might work. To reduce the likelihood of damaging price crashes, the MMLR should be willing to purchase securities at a price that is normally unattractive. In other words, the MMLR would place an unlimited buy order at a relatively low price – below their estimate of fundamental value.

Previous central bank market-stabilising asset purchases have generally not worked this way. In some cases, MMLR interventions were simply announcements of willingness to purchase securities, without specifying a purchase price. The Federal Reserve's corporate credit facilities had a cap and purchased bonds and ETFs at market prices.[69] The Bank of England's Asset Purchase Facility (APF), put in place in January 2009, was somewhat different. The original purpose of the APF was to catalyse activity in markets for UK non-financial corporate bonds and commercial paper. To achieve this, the Bank of England offered to purchase securities at a price that implied a spread over the sovereign rate below those in the disorderly market, but significantly above what was expected in normal conditions. Setting the price required the Bank of England to have the expertise to value any bond that it would consider purchasing.[70]

There are also examples of standard practices that are intended to stabilise financial markets even in normal times. For example, since 1969, the Federal Reserve has been lending US Treasury securities to primary dealers at rates currently determined in an auction. These daily operations are designed to reduce the likelihood of price spikes and dealers failing to deliver securities they agreed to sell, among other things.[71] Similarly, to ensure that stable sovereign bond markets continue to play their critical role in the monetary policy transmission mechanism, the Eurosystem national central banks purchase securities under the public sector purchase programme (PSPP) available for lending at the deposit facility rate minus 20 basis points.[72]

We can view a recent innovation in Federal Reserve operating procedures as a move to create an MMLR. Following the September 2019 upheaval in the Treasury repo market, the Federal Reserve designed and implemented a channel system for the repo rate. That is, it set a repo rate and a reverse repo rate. At the time of writing this report, they operate with a 20 basis point spread and have limits. However, it is easy to interpret these as mechanisms for stabilising the repo market.[73]

In closing, as with the LOLR, the central bank needs a strategy for withdrawing MMLR support. In our view, exit should proceed quickly and have as little price impact as possible. When the MMLR's

---

69 As we discuss in Section 2, the Federal Reserve's Secondary Market Corporate Credit Facility appears to have had a large announcement effect.

70 See the description in Fisher (2010).

71 See **the first record of the Federal Reserve lending securities**.

72 See the **ECB's webpage** for details on implementation and Pelizzon, Subrahmanyam and Tomio (2022) for information on the role that the securities lending facility had in reducing mispricing in the German and Italian treasury markets.

73 We note that so long as the Federal Reserve continues its "ample reserves regime", financial intermediaries (mostly mutual funds) will use the reverse repo facility intensively. But there will be little, if any, activity in the repo facility. As a result, we might better interpret the current regime as a floor, rather than corridor, system. See Afonso et al. (2022a and 2022b).

purchases are small – as was the case for the Federal Reserve's recent corporate credit facility – this is straightforward.[74] On the other hand, if quantities are large, the central bank may have to unwind the position slowly and in a way that does not distort market prices. A more diversified basket of eligible securities may also lower the market price impact of the unwinding of the securities purchases.

4.4 Choosing how to stabilise financial markets

How might one choose between an enhanced LOLR and an MMLR? When should the central bank lend and when should it buy? Since the goal is to ensure that financial markets function normally, the natural choice would be to lend and, to the extent possible, allow private agents to determine securities prices and allocate capital resources.[75] This means preferring an enhanced LOLR whenever possible. Unfortunately, there are circumstances in which this could fail. That is, offering to lend, regardless of how low the rate, may not be sufficient to bring investors and market makers back. As described earlier, there are numerous circumstances in which this could be the case, namely when private sector market makers withdraw, when typical market participants on the buy side disappear, when the quality of the security itself comes into question, when it is difficult to activate an enhanced LOLR quickly, and when it is impossible to determine the solvency (or identity) of appropriate LOLR counterparties. In these cases, assuming the central bank does not share market participants' concerns about security quality, policymakers may need to consider the outright purchase of the security as an MMLR to restore market function.

Regardless of how they choose to stabilise financial markets, whether it is through enhanced lending or direct purchases, central bankers must make a number of decisions, some of which might require legislative changes. Here are a few:

1. Which securities markets are sufficiently important to warrant intervention? The natural answer is that concern should be with markets that are systemic. That is, the MMLR should focus only on markets where episodes of acute illiquidity place the financial system, the real economy and the monetary policy transmission mechanism at risk. The list would start with government debt, and then could include corporate bonds, mortgage-backed securities and anything else that is critical for a given central bank.[76]

2. Should the enhanced LOLR or the MMLR be a standing facility, a permanent but usually dormant facility, or an ad hoc facility? As a part of their normal daily operations, central banks typically have the capacity to assess and manage collateral, as well as price a broad array of securities. This means that authorities will always be able to create such a facility at short notice. So, while standing facilities and other permanent arrangements exacerbate moral hazard, impromptu facilities will have similar moral hazard effects once market participants

[74] From 12 May 2020 to 31 December 2020, the Secondary Market Corporate Credit Facility (SMCCF) purchased a total of USD 14 billion worth of bonds and bond ETFs. From 7 June 2021 to 31 August 2021, these had all either matured or were sold.

[75] As we emphasise, since lending is collateralised, the central bank will have to take a view on the value of the collateral and apply an appropriate haircut. This alone could distort market prices.

[76] Eisenbach and Phelan (2022) describe the "market runs" against US Treasury securities in March 2020 as a result of strategic interactions among investors holding Treasuries for their liquidity characteristics.

become convinced that authorities will create them whenever market illiquidity poses a material threat to financial stability.

3. Most importantly, is it possible to mitigate the moral hazard that public sector backstops inevitably create? By providing a backstop to financial markets, liquidity will likely be under-priced. Furthermore, knowing that the central bank will step in, market participants may behave in ways that will hasten intervention. Even if the central bank is of the opinion that there has been no deterioration in the quality of the security whose market is malfunctioning, penalty terms can mitigate moral hazard.[77] This means ensuring that pricing is at a level that would be unattractive in normal times. For lending facilities, the interest rate and haircut should imply costs that would be high in normal times. For purchase facilities, the central bank should continuously re-evaluate conditions, offering to buy at prices that are below those that prevail when financial markets are operating normally.

4. How is counterparty eligibility defined and what are the criteria for participation? In the case of the enhanced LOLR, ensuring the solvency of the central bank's counterparties requires limiting access to regulated and supervised entities. By contrast, any entity able to reliably deliver the security should access the MMLR.

5. Should interventions be in both the primary and secondary markets? Common practice in advanced economy central banking is to restrict purchases of securities, especially sovereigns, to the secondary market. That said, there may be circumstances when neither secondary market purchases nor enhanced LOLR operations succeed in restoring solvent would-be issuers' access to the primary markets. In such cases, if legally possible, the MMLR should consider primary market purchases.

6. Finally, should the credit and market risks taken on by the central bank as enhanced LOLR and MMLR be for the account of the central bank or for the fiscal authority that is the beneficial owner of the central bank? This matters because if there is no adequate fiscal compensation for central bank losses, the central bank may be forced to maintain its solvency by expanding the monetary base to such an extent that its price stability mandate is threatened.[78]

---

[77] Rigorous regulation and supervision of liquidity risk borne by financial institutions, including the possibility of macroprudential buffers or add-ons, can reduce the frequency of episodes of acute financial stress and thus reduce the need for central banks to intervene. In the following point, we are implicitly assuming that financial stress has already appeared.

[78] See Buiter (2022).

5 Desirable attributes of a framework for stabilising financial markets

Our discussion of the possible design features and potential costs, combined with our survey of central banks' experiences, lead us to develop the following set of desirable attributes for an effective enhanced LOLR or MMLR:

1. Be transparent and clear. When lending or buying, explain the objectives, instruments and terms, and provide a clear justification for the establishment of the facility. If the purpose of a facility changes, describe what is happening and provide a justification.

2. Support only financial markets deemed essential. In the choice of target markets and instruments, be clear that the purpose of interventions is to address financial stability risks. The aim is to address market dysfunction, not to steer credit to favoured sectors, firms, individuals or governments.

3. To ensure their solvency, lend only to regulated and supervised counterparties. As an MMLR, buy from all sellers, insisting on delivery versus payment.

4. Set up facilities so that counterparties initiate loans and purchases. For lending, offer loans with clear terms and let borrowers choose whether and how much to borrow. For purchases, set a price and offer to buy however much sellers wish to sell.

5. Develop and maintain an ongoing capacity to price securities that could be accepted as collateral in a lending operation or be purchased outright.

6. Control moral hazard by offering pricing that would be unattractive in normal times. Lending rates and haircuts should carry costs that are high in normal times. When purchasing outright, offer to buy at prices that are below the bids offered when financial markets are operating normally.

7. Lend or buy as little as possible and, when feasible, sterilise the interventions to distinguish them from expansionary monetary policy.

8. Recognise that credible announcements may reduce the scale of required interventions. Experience suggests that when markets become illiquid and market participants believe the central bank will lend or purchase a sufficiently large amount, then it may not be necessary for the central bank to do much.

9. Exit quickly. Have an announced policy in place that establishes the timing and trajectory for normalisation (including the sale of assets acquired through the MMLR operation and the unwinding of loans made through the LOLR operation).

10. Control balance sheet risk. State clearly who bears the credit and market risk associated with the transactions. Indicate whether the fiscal authority is providing indemnification or whether losses will be borne by the central bank.

6 Conclusion

The ECB states in its monetary policy strategy: “Financial stability is a precondition for price stability, and vice versa”.[79] Without a stable, well-functioning financial system, central banks are unable to achieve their price stability or dual mandate. Consequently, over the past years, whenever financial markets ceased operating normally, policymakers expanded the scale and scope of their lending operations and broadened the range of financial asset purchase operations to include a wide range of private assets. Unless legislatures change the rules that govern them, it seems unlikely that central banks that have intervened to rescue markets on multiple occasions since 2007 could credibly claim that they would not do the same in a future crisis. Market participants know that central banks will always act again, creating moral hazard.

In this report, we do not assess the merits of central banks’ actions. Instead, assuming they will intervene, we examine how to design two types of facilities that central banks use to maintain liquidity in systemically important financial markets: an enhanced LOLR and a MMLR. The traditional LOLR makes loans to banks and other intermediaries against a limited set of high-quality collateral.

A much wider range of collateral is now accepted in enhanced LOLR operations. A broad array of non-bank financial intermediaries (NBFIs) and non-financial firms receive credit either directly from the central bank or from banks through subsidised central bank lending programmes. By contrast, the MMLR purchases temporarily illiquid securities outright from any willing seller that can reliably deliver the securities.

In this report, we discuss the structure and potential costs of these interventions. Central banks intervene to ensure that distress in financial markets does not spill over, constraining credit, harming the real economy and impairing the functioning of the monetary policy transmission mechanism. On the design, we conclude that policymakers should only resort to outright purchases when lending facilities cannot be made to work. Finally, on potential costs, we note how the presence of last resort facilities can lead economic agents to take on additional risk. This reduces systemic resilience and further increases the probability of a central bank intervention. Additionally, these facilities can distort prices, reducing the allocative efficiency of capital markets. Minimising the potential for moral hazard requires the combination of rigorous regulatory and supervisory frameworks and a pricing scheme that makes the enhanced LOLR and MMLR unattractive in normal times. For banks, this may require enhancing prudential liquidity requirements to minimise the need for central bank support.[80] For non-banks, this may require developing a stronger regulatory framework commensurate with their increasing role in financial intermediation.

Given that central banks are likely to continue to intervene, it is essential that we continue refining a framework for stabilising systemically important financial markets. First and foremost, we need an agreed-upon procedure for determining which markets are systemic and deserving of central bank support. Any decision to intervene requires judgement on whether these markets are strictly

[79] See European Central Bank (2021).

[80] For an early contribution to this discussion, see Clerc et al. (2016).

necessary for a well-functioning financial system, as well as an understanding of how financial markets are related to each other and how financial market disruptions can influence the real economy and the operation of the monetary policy transmission mechanism. Second, central banks need to develop a continuous capacity to price securities when markets disappear. Collateral frameworks already require estimation of fundamental values, but these will need to be expanded to include valuation of a potentially wider set of securities. Third, appropriate counterparties, likely including non-bank financial institutions, need to be identified for the enhanced LOLR. Fourth, decisions need to be made about whether enhanced LOLR and MMLR facilities should remain ad hoc or become permanent but usually dormant facilities. Finally, facilities need to be structured in ways that mitigate moral hazard. This means improving our understanding of how we can adjust the prudential regulatory and supervisory regime to reduce the reliance of financial intermediaries on the central bank backstop in episodes of illiquidity.

References

Afonso, G., Logan, L., Martin, A., Riordan, W. and Zobel, P. (2022a), "**How the Fed's Reverse Repo Facility Works**", *Liberty Street Blog*, January.

Afonso, G., Logan, L., Martin, A., Riordan, W. and Zobel, P. (2022b), "**The Fed's Latest Tool: A Standing Repo Facility**", *Liberty Street Blog*, January.

Bagehot, W. (1873), *Lombard Street: A Description of the Money Market*, Henry S. King & Co., London, Great Britain, reprinted by **Charles Scribner's Sons**, New York, 1897.

Bank for International Settlements (2022), "**Market dysfunction and central bank tools**", May.

Bennett, A., Baliño, T.J.T. and Borensztein, E. (1999), "**Monetary Policy in Dollarized Economies**", *IMF Occasional Paper*, No 171, March.

Bindseil, U., Corsi, M., Sahel, B. and Visser, A. (2017), "**The Eurosystem collateral framework explained**", *ECB Occasional Paper Series*, No 189, May.

Buiter, W. (2022), "**Towards an enhanced lender of last resort and a market maker of last resort**", manuscript, March.

Buiter, W. and Sibert, A. (2007), "**The central bank as the market maker of last resort: from lender of last resort to market maker of last resort**", *VoxEU*, August.

Cantú, C., Cavallino, P., De Fiore, F. and Yetman, J. (2021), "**A global database on central banks' monetary responses to Covid-19**", *BIS Working Paper*, No 934, March.

Cecchetti, S.G. and Schoenholtz, K.L. (2022), "**Central Banks' New Frontier: Interventions in Securities Markets**", **Blog Money and Banking** August.

Cecchetti, S.G. and Tucker, P.M.W. (2021), "**Understanding How Central Banks Use Their Balance Sheets: A Critical Categorization**", **Blog Money and Banking** June.

Cieslak, A. and Vissing-Jorgensen, A. (2021), "**The Economics of the Fed Put**", *The Review of Financial Studies*, Vol. 34, Issue 9, pp. 4045-4089.

Clerc, L., Giovannini, A., Langfield, S., Peltonen, T., Portes, R. and Scheicher, M. (2016), "**Indirect contagion: the policy problem**", *Occasional Paper Series*, No 9, European Systemic Risk Board.

Committee on the Global Financial System (2010), "**The role of margin requirements and haircuts in procyclicality**", *CGFS Papers*, No 36, March.

Dang, T.V., Gorton, G.B. and Holmström, B.R. (2019), "**The Information View of Financial Crises**", *NBER Working Paper*, No 26704, July.

de Guindos, L. and Schnabel, I. (2020a), "**The ECB's commercial paper purchases: A targeted response to the economic disturbances caused by COVID-19**", *The ECB Blog*, April.

de Guindos, L. and Schnabel, I. (2020b), "**Improving funding conditions for the real economy during the COVID-19 crisis: the ECB's collateral easing measures**", *The ECB Blog*, April.

Demirgüç-Kunt, A. and Kane, E.J. (2002), "**Deposit insurance around the globe: where does it work?**", *Journal of Economic Perspectives*, Vol. 16, No 2, pp. 175-195.

Draghi, M. (2012), "**The monetary policy of the European Central Bank and its transmission in the euro area**", *speech at Università Bocconi*, Milan, November.

Duffie, D. (2020), "**Still the world's safe haven? Redesigning the U.S. Treasury Market after the COVID-19 Crisis**", *Working Paper*, No 62, Brookings Institution, Hutchins Center, June.

Eisenbach, T. and Phelan, G. (2022), "**How can safe asset markets be fragile?**", Liberty Street Economics, Federal Reserve Bank of New York, September.

European Central Bank (2021), "**An overview of the ECB's monetary policy strategy**", *Economic Bulletin*, Issue 5, pp. 75-89.

European Systemic Risk Board (2020), "**Mitigating the procyclicality of margins and haircuts in derivatives markets and securities financing transactions**", January.

European Systemic Risk Board (2021), "**Issues note on systemic vulnerabilities of and preliminary policy considerations to reform money market funds (MMFs)**", July.

Federal Open Market Committee (2020), "**Statement**", March.

Financial Stability Board (2021), **Global Monitoring Report on Non-Bank Financial Intermediation 2021**, December.

Fisher, P. (2010), "**The Corporate Sector and the Bank of England's Asset Purchases**", *speech at the Association of Corporate Treasurers Winter Paper 2010*, February.

Fleming, M. and Keane, F. (2021), "**The netting efficiencies of marketwide central clearing**", *Staff Reports*, No 964, Federal Reserve Bank of New York, April.

Fu, D. (2001), "**Currency Board and Market Intervention in Hong Kong**", *Southwest Economy*, Federal Reserve Bank of Dallas, pp. 13-14, May/June.

Gilchrist, S., Wei, B., Yue, V.Z. and Zakrajšek, E. (2020), "**The Fed takes on corporate credit risk: an analysis of the efficacy of the SMCFF**", *NBER Working Paper*, No 27809, September.

Goodhart, C. and Dai, L. (2003), *Intervention to Save Hong Kong: Counter-Speculation in Financial Markets*, Oxford University Press, Oxford.

Hattori, T. and Yoshida, J. (2022), **"The Impact of Bank of Japan's Exchange-Traded Fund Purchases"**, *Journal of Financial Stability*, July.

Holmström, B. (2015), "**Understanding the role of debt in the financial system**", *BIS Working Paper*, No 479, January.

King, D., Brandao Marques, L., Eckhold, K., Lindner, P. and Murphy, D. (2017), "**Central Bank Emergency Support to Securities Markets**", *IMF Working Paper*, No 2017/152, July.

Lane, P. (2020a), "**The market stabilisation role of the pandemic emergency purchase programme**", The ECB Blog, June.

Lane, P. (2020b), "**The macroeconomic impact of the pandemic and the policy response**", The ECB Blog, August.

Lane, P. (2020c), "**The Monetary Policy Package: An Analytical Framework**", The ECB Blog, March.

Lee, H. and Sarkar, A. (2017), "**Counterparty and Collateral Practices of Central Bank Lending Facilities**", *Liberty Street Economics*, August.

Liang, J.N. (2020), "**Corporate bond market dysfunction during COVID-19 and lessons from the Fed's response**", *Working Paper*, No 69, Brookings Institution, Hutchins Center, October.

Liew, L.H. and Wu, H.X. (2002), "**Not All Currency Traders Believe in Unfettered Free Markets: Currency Speculation and Market Intervention in Hong Kong**", *The China Quarterly*, No 170, June, pp. 441-458.

Lucas, D. (2019), "**Measuring the Cost of Bailouts**", *Annual Review of Financial Economics*, Vol. 11, pp. 85-108.

Nyborg, K.G. (2017), "**Central bank collateral frameworks**", *Journal of Banking & Finance*, Vol. 76, Issue C, pp. 198-214, October.

Pelizzon, L., Subrahmanyam, M.G. and Tomio, D. (2022) "**Central Bank-Driven Mispricing**", *SAFE Working Paper*, No 226, July.

Reinhart, C.M. and Rogoff, K.S. (2011), "**From Financial Crash to Debt Crisis**", *American Economic Review*, Vol. 101, No 5, pp. 1676-1706.

Rosenblum, H., Alm, R., DiMartino, D. and Renier, J.J. (2008), "**Fed Intervention: Managing Moral Hazard in Financial Crises**", *Federal Reserve Bank of Dallas Economic Letter*, Vol. 3, No 10, October.

Schwartz, A.J. (1992), "**The Misuse of the Fed's Discount Window**", *Review of the Federal Reserve Bank of St. Louis*, Vol. 74, No 5, pp. 58-69, September/October.

Tarullo, D.K. (2013), "**Macroprudential Regulation**", *speech at the Yale Law School Conference on Challenges in Global Financial Services*, September.

Trichet, J.-C. (2008), "**The financial turbulence: Where do we stand?**", *speech at the Economic Club of New York*, October.

Tucker, P. (2009), "**The repertoire of official sector interventions in the financial system: last resort lending, market-making, and capital**", *speech at the Bank of Japan 2009 International Conference, Tokyo*, May.

Tucker, P. (2014), "**Regulatory Reform, Stability, and Central Banking**", Hutchins Center on Fiscal and Monetary Policy at Brookings, January.

Witt, E. and Blaschke, J. (2018), "**ECB data for analysis and decision-making: data governance and technology**", *paper presented at the Ninth IFC Conference on "Are post-crisis statistical initiatives completed?"*, Basel, August.

Imprint and acknowledgements

We gratefully acknowledge comments from members of the Advisory Scientific Committee (chaired by Javier Suarez and Loriana Pelizzon) and of the General Board (chaired by Christine Lagarde), as well as discussions with Paul Fisher, Philipp Hartmann, Andres Manzanares, Carol Osler, Kim Schoenholtz, Javier Suarez, Paul Tucker, Paul Wachtel and Olaf Weeken.

Willem Buiter
Independent Economic Adviser; email: **whb1002@gmail.com**

Stephen Cecchetti
Brandeis International Business School, Massachusetts, United States; email: **cecchett@brandeis.edu**

Kathryn Dominguez
University of Michigan, Ann Arbor, United States; email: **kathrynd@umich.edu**

Antonio Sánchez Serrano
European Systemic Risk Board, Frankfurt am Main, Germany; email: **antonio.sanchez@esrb.europa.eu**

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website **www.esrb.europa.eu**

Note: The views expressed in the Reports of the Advisory Scientific Committee are those of the authors and do not necessarily reflect the official stance of the ESRB or its member organisations. In particular, any views expressed in the Reports of the Advisory Scientific Committee should not be interpreted as warnings or recommendations by the ESRB as provided for in Art. 16 of Regulation No 1092/2010 of 24 November 2010, which are subject to a formal adoption and communication process.

The cut-off date for the data included in this report was 31 August 2022.

For specific terminology please refer to the **ESRB glossary** (available in English only).

PDF ISBN 978-92-9472-300-0, ISSN 2467-0685, doi:10.2849/611143, DT-AE-23-001-EN-N