

Central banks as liquidity providers of last resort

Trends, challenges and taxonomy

DeNederlandscheBank

EUROSYSTEM

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Abbreviations

ABSPP	Asset-Backed Securities Purchase Programme
AMLF	Asset-Backed Commercial Paper Money Market Funds Liquidity Facility
BAU	Business as usual
BIS	Bank for International Settlements
BTFP	Bank Term Funding Program
CBPP	Covered Bond Purchase Programme
CCP	Central Clearing Counterparty
COVID	Corona Virus Disease
CPFF	Commercial paper Funding Facility
ECB	European Central Bank
ELA	Emergency Liquidity Assistance
ESM	European Stability Mechanism
FRFA	Fixed-Rate Full Allotment
GFC	Global Financial Crisis
HQLA	High Quality Liquid Assets
IMF	International Monetary Fund
LCR	Liquidity Coverage Ratio
LDI	Liability-Driven Investment
LOLR	Lender of Last Resort
LPLR	Liquidity Provider of Last Resort
MBS	Mortgage-Backed Securities
MLF	Marginal Lending Facility (Eurosystem)
MLF	Municipal Liquidity Facility (Federal Reserve)
MMIFF	Money Market Investor Funding Facility
MMLF	Money market Mutual Fund Liquidity Facility
MMLR	Market Maker of Last Resort
MMMF	Money Market Mutual Fund
MRO	Main Refinancing Operation
MSLP	Main Street Lending Program
NBFI	Non-Bank Financial Institution
NSFR	Net Stable Funding Ratio
OIS	Overnight Index Swap
OMT	Outright Monetary Transactions
PDCF	Primary Dealer Credit Facility
PELTRO	Pandemic Emergency Longer-Term Refinancing Programme
PEPP	Pandemic Emergency Purchase Programme
PMCCF	Primary Market Corporate Credit Facility
PPP	Paycheck Protection Program
PPPLF	Paycheck Protection Program Liquidity Facility
SFF	Standby Financing Facility
SLF	Special Liquidity Facility

SMCCF	Secondary Market Corporate Credit Facility
SMP	Securities Markets Programme
SPV	Special Purpose Vehicle
TAF	Term Auction Facility
TALF	Term Asset-backed Securities Loan Facility
TLTRO	Targeted Longer-Term Refinancing Operations
TPI	Transmission Protection Instrument
TSLF	Term Securities Lending Facility
Y2K	Year 2000

1 Introduction¹

Liquidity provision is a core task of central banks. In most monetary policy frameworks, the creation of central bank reserves is part of the mechanism to steer interest rates and broader financial conditions. Beyond this regular monetary policy function, liquidity provision also plays a crucial role in alleviating financial stress. Traditionally, this latter function is referred to as “last resort” liquidity provision and encompasses both emergency liquidity assistance (ELA) to individual institutions and market-wide liquidity injections.

Over the past two decades, the scope and design of central banks’ last-resort liquidity provision have expanded substantially.

Whereas such interventions were historically focused on lending to banks, central banks have increasingly provided liquidity to non-bank financial institutions (NBFIs) and intervened directly in financial markets. At the same time, the central bank toolkit has diversified, with the introduction of new instruments and a greater degree of transparency regarding their objectives and modalities. Moreover, last-resort liquidity provision has become more closely intertwined with other policy domains, notably monetary policy and post-GFC financial regulation.

This study examines recent developments in the liquidity provider of last resort (LPLR) function and the main challenges going forward.² Our focus is on central banks in major advanced economies – particularly the Eurosystem and the Federal Reserve – although several of the trends discussed are also relevant for smaller central banks and emerging market economies. Graph 1 illustrates how LPLR operations evolved

in the euro area and the United States since 1999. Most of these operations were concentrated around the global financial crisis (GFC) in 2008 and its aftermath, and the COVID crisis in 2020. Whereas earlier interventions mainly took the form of market-wide lending operations, central banks have increasingly implemented targeted operations and outright purchases in financial markets.

The study is organised as follows:

- Section 2 defines the scope of our study, presents key principles – the backstop, inertia, and separation principles – and discusses the associated trade-offs in terms of effectiveness and risk-taking.
- Section 3 analyses how LPLR policies have evolved over the past decades. The scope of these operations has broadened as financial systems have expanded and become less bank-centric; central banks have become more transparent about the use of LPLR instruments; and LPLR liquidity provision increasingly interacts with other policy domains, particularly monetary policy and financial regulation. To classify LPLR instruments, we present a taxonomy that ranges from bilateral lending operations to interventions in specific markets. Annex A presents a detailed overview of individual LPLR tools that have been implemented by the Eurosystem and the Federal Reserve.
- Section 4 discusses practical considerations in the implementation of LPLR tools. Feasible actions are typically constrained by operational, legal and state-dependent considerations. Policymakers also face trade-offs between proactive and reactive measures, as well as between limited and large-scale interventions.

¹ We thank Ulrich Bindseil, Willem Buiter, Tomás Carrera de Souza, Jan Willem van den End, Gabriele Galati, Niels Gilbert, Maarten Groenen, Floris van Loo, Bill Nelson, Anna Samarina and John Thoolen for useful comments on an earlier version. The usual disclaimer applies.

² We use the term LPLR throughout this paper, as a general term encompassing traditional lender of last resort (LOLR) operations, extended LOLR operations and market maker of last resort (MMLR) operations. Section 2 explains this terminology in more detail.

Additional issues concern the interaction of LPLR instruments with other policy tools and the design of a smooth exit from LPLR operations once these are no longer needed.

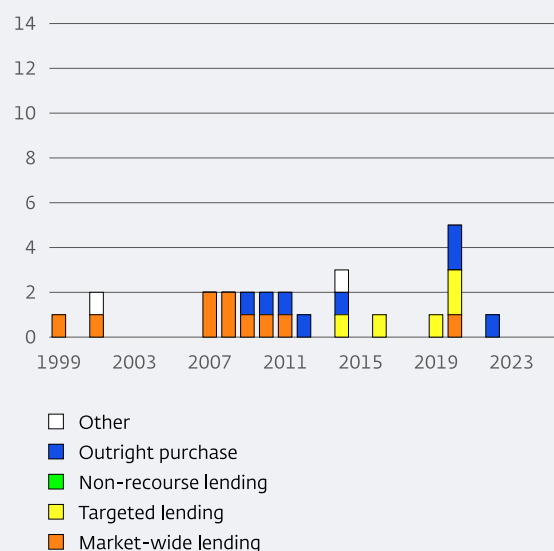
- Section 5 concludes by outlining challenges for the future role of the LPLR. As the role of NBFIs and market-based finance continues to grow, central banks may consider more direct forms of liquidity provision to these entities and more frequent interventions in financial markets. Recent crises episodes show that both the speed and scale of liquidity support

have increased, placing greater demands on operational readiness. Finally, the increasingly blurred boundary between LPLR tools and monetary policy may require a reformulation of the separation principle, shifting the focus away from liquidity creation in a narrow (i.e. central bank reserves) sense towards liquidity in a more general context, including liquidity held by NBFIs and market liquidity. Separation would then be defined in terms of the purpose of the instrument: steering monetary policy stance versus addressing financial stress and market dysfunction.

Graph 1 LPLR operations since 1999

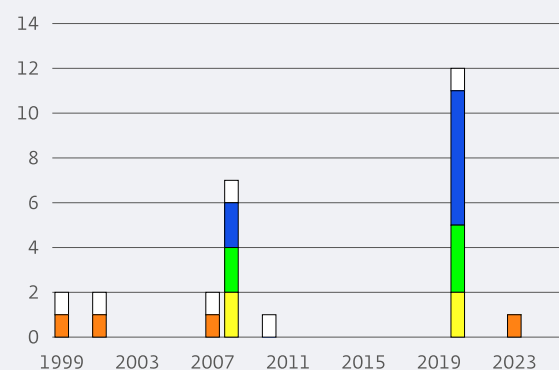
Euro area

Number of tools launched per year



United States

Number of tools launched per year



Source: Annex A.

Explanation: operations are linked to the year they were launched, even if they remained in place over several years. Operations include pure LPLR operations as well as hybrid tools combining LPLR and monetary policy stance goals. Not included are permanent facilities (such as the Eurosystem's Marginal Lending Facility and the Federal Reserve's discount window) and institution-specific emergency support measures. The breakdown in types of operations is discussed in Box 2 (Section 3).

2 Definition, scope and key principles

2.1 Definition and scope

We define the LPLR function as the provision of liquidity to financial institutions and markets when regular access to liquidity is disrupted.

Under normal circumstances, solvent institutions should be able to attract liquidity without official LPLR support. Similarly, financial markets should facilitate price discovery and efficient allocation without central bank interventions. In times of market dysfunction, however, a LPLR can provide a safety net by containing spillovers and preventing liquidity stress from escalating into a systemic crisis.

The LPLR role is typically performed by a central bank which, as the issuer of public (fiat) money, is uniquely positioned to supply new liquidity in times of stress. The LPLR function is closely linked to monetary policy, as the smooth functioning of financial markets is essential for monetary transmission. In practice, LPLR operations are often implemented alongside or in combination with other financial safety nets, such as deposit guarantee schemes or government measures aimed at supporting institutions' solvency or, where appropriate, facilitating their orderly failure.

Taking a system-wide perspective, we use a broad concept of the LPLR function. Some authors have defined LPLR more narrowly, focusing on emergency liquidity assistance (ELA) to individual banks.³ By contrast, a broader concept also encompasses sector-wide liquidity provision to a range of financial institutions and

markets. This broader perspective is essential for understanding how central bank liquidity operations have evolved over recent decades. Reflecting changes in the financial system – whose size has increased relative to the real economy and in which NBFIs and financial markets play a growing role – such operations have become less bank-centric and more explicitly motivated by systemic considerations (see Section 3).

Our LPLR definition therefore includes both enhanced lender of last resort (LOLR) and market maker of last resort (MMLR) operations.

Enhanced LOLR operations extend beyond traditional liquidity provision to banks and may involve a wider range of counterparties and alternative design features.⁴ MMLR interventions, by contrast, are aimed primarily at stabilising financial markets rather than institutions. Examples are MMLR interventions in sovereign bond markets and markets that are important for bank funding such as covered bonds and asset-backed securities (see Annex A). MMLR support can be provided directly, through outright asset purchases in stressed markets, or indirectly, through lending operations to financial institutions that are intended to channel liquidity to specific market segments. In practice, the difference between markets-focused and institutions-focused operations is not as sharp as one might think, as liquidity problems affecting specific markets and institutions are often intertwined. In other words: the central bank may intervene in markets to (also) support players on

³ For instance, Goodhart (1999) adopts a narrow concept limited to bilateral liquidity assistance, excluding market-wide liquidity injections on the grounds that these are difficult to distinguish from regular monetary policy operations. By contrast, Bindseil (2014, 2016) and Bats et al. (2018) apply a broader definition encompassing both bilateral and market-wide lending. Buiter et al. (2023) adopt an even wider concept, similar to that used in this paper, which includes a wide range of lending operations as well as last-resort interventions through outright asset purchases in financial markets.

⁴ The term "enhanced LOLR" was introduced by Buiter et al. (2023), who particularly emphasise lending to NBFIs and against a wide set of collateral as key features.

these markets or provide liquidity to these players to (also) support market functioning.^{5,6} Box 2 in Section 3 presents a continuum of LPLR-related operations, ranging from ELA to MMLR measures. While the importance of MMLR interventions has grown since the Global Financial Crisis (GFC), they have a long historical precedent.⁷ Finally, a relevant aspect of MMLR operations is that they focus less on the creation of central bank reserves per se and more on supporting *market* liquidity.⁸

At the same time, we delineate our LPLR concept in several respects. First, we focus exclusively on the role of central banks; other institutions that can provide similar or complementary support are outside our scope. For instance, the International Monetary Fund (IMF) is often regarded as the international lender of last resort, while governments can provide liquidity support, capital injections and guarantees. Second, we exclude central bank liquidity provision that can be considered “business as usual” (BAU). This includes, for instance, intraday credit to support payment systems and regular liquidity operations conducted as part of routine monetary policy implementation. Admittedly, there is a grey area as some BAU instruments – such as standing facilities – can be part of monetary policy implementation but also a first line of defence against emerging liquidity stress. Third, we exclude unconventional

operations that are exclusively aimed at steering the monetary policy stance. Although large-scale asset purchases and targeted lending operations may be technically similar to LPLR operations, they are typically designed to achieve macroeconomic objectives, such as price stability. To be effective, such operations usually involve larger volumes and longer implementation horizons than LPLR interventions. Again, a grey area arises as large-scale liquidity creation may, as a side-effect, support market functioning or alleviate firms’ liquidity constraints. Moreover, some instruments have been designed as hybrid operations, serving both LPLR and monetary policy stance objectives; such hybrid instrument are included in our analysis. Past examples of hybrid tools are the Eurosystem’s Targeted Longer-Term Refinancing Operations (TLTRO), first implemented in 2014, and the Pandemic Emergency Purchase Programme (PEPP) launched at the onset of the COVID crisis in 2020. Annex A provides a further discussion of these and other hybrid instruments. Fourth and finally, we exclude interventions in foreign exchange markets aimed at countering excessive currency appreciation or depreciation. While such operations resemble LPLR measures, particularly when aimed at addressing market dysfunction or counteract deviations from fundamentals, they fall outside the scope of our analysis.

5 Conceptually, the distinction between markets-focused and institutions-focused operations mirrors the distinction between addressing market liquidity risk and funding liquidity risk, while recognizing that these risks are closely interrelated (Brunnermeier and Pedersen, 2009).

6 The Bank of England’s intervention in the long-term gilt market in 2022 is a good example of an operation conducted through outright purchases while at the same time supporting institutions – Liability-Driven Investment (LDI) funds – that played a central role in excessive price movements. The opposite approach – directly providing liquidity to LDI funds and thereby supporting the market – was also considered but was not deemed feasible. See Section 4.1 and Hauser (2022) for a further discussion on the gilt intervention.

7 An early historical example is the direct market intervention by the US financial authorities under Alexander Hamilton in 1792, aimed at stabilising the US Treasury market (Sylla et al., 2009).

8 Some MMLR programmes, such as the Eurosystem’s Securities Markets Programme (SMP) launched in 2010, were even accompanied by liquidity-absorbing operations to sterilise the reserve creation (see Rostagno et al., 2019). This helped avoid interference with regular money market operations and limit the risk of unwarranted asset price inflation elsewhere in the economy.

2.2 Principles for last-resort liquidity provision

Over time, a set of key principles for last-resort liquidity provision has emerged. Bagehot (1873) argued that the central bank should lend freely, at a high interest rate and against good collateral. The central bank should be willing to supply as much liquidity as the public needs, in order to prevent a panic developing into a deep systemic crisis. High interest rates discourage excessive or opportunistic borrowing, while good collateral helps to protect the central bank against losses. Bagehot's views remain relevant and have been further discussed and refined over time. In what follows, we distinguish the following three broad principles:

- **Backstop principle.** Operations should be designed to ensure access to liquidity during crises but not interfere with market functioning in normal times (BIS Markets Committee, 2022). This means that operations are deployed as a last resort and are calibrated to discourage unintended use. Backstop pricing can be defined as interest rates below crisis rates, but above rates that would prevail in normal times.⁹ The backstop principle of LPLR operations can also be enforced through non-price features, for instance by limiting their availability to periods

of significant market stress. A special case of limited availability is constructive ambiguity, whereby some uncertainty is deliberately maintained regarding the conditions for, and willingness to provide, liquidity support (an approach that contrasts with the recent trend towards greater ex ante transparency – see Section 3). While the backstop principle is often motivated by concerns about moral hazard, the risk of unintended use may also refer to other effects such as a cannibalisation of well-functioning market segments.¹⁰

- **Inertia principle.** The LPLR should refrain from tightening its risk control framework during a crisis (Bindseil, 2014). It should continue to accept assets that qualify as good collateral in normal times – based on their credit quality and liquidity – and avoid applying higher haircuts solely in response to deteriorating market conditions. By maintaining stable collateral eligibility criteria and valuation practices, the inertia principle helps prevent LPLR operations from amplifying stress and contributing to a self-sustaining spiral of declining asset prices and tightening liquidity conditions. A step further would be to relax lending conditions, for instance by temporarily broadening the collateral framework or reducing haircuts, in order to contain a liquidity crisis.¹¹

⁹ Throughout this paper, we use the terms backstop pricing and backstop rates rather than penalty rates, as they have a more neutral connotation.

¹⁰ Presumably, Bagehot himself was not so much concerned about moral hazard, but about liquidity scarcity – under the gold standard – and the possibility that institutions that did not need liquidity would resort to the central bank. In fiat money systems, this motivation for high rates has become less relevant because there is no limit to liquidity creation. See e.g. Bernanke (2008), Goodhart (1999) and Martin (2009).

¹¹ Bindseil and Lanari (2022) present a framework in which relaxation of a central bank's collateral conditions in a crisis helps to preserve banks' funding stability, so their actual recourse to central bank lending facilities remains limited.

■ **Separation principle.** The LPLR function is most effective when it is clearly separated from any other policies, in line with the Tinbergen rule that each policy goal should ideally be pursued with a dedicated instrument. This principle is particularly relevant in relation to a central bank's other responsibilities alongside the LPLR function, notably monetary policy but also supervision and regulation.¹² It also implies that the central bank should be cautious with the use of hybrid instruments which simultaneously pursue stabilisation and monetary policy stance objectives. Once these goals are no longer aligned, hybrid tools may generate unintended or unwarranted effects.¹³ Since the GFC, central bank balance sheets have expanded markedly due to unconventional policies, resulting in large-scale reserves creation. At the same time, central bank reserves became increasingly important for banks to comply with post-GFC liquidity regulation, most notably the liquidity coverage ratio (LCR). In many jurisdictions, these developments led to a de facto shift from "scarce liquidity" corridor systems to "abundant liquidity" floor systems in which the remuneration on excess reserves became the main anchor for money market rates and thus the effective

policy rate. Importantly, the remuneration on excess reserves in such floor systems was close to the overnight money market rate, making banks' opportunity cost of holding reserves very low. See Box 3 in Section 3 for a further discussion about central bank operational frameworks and the separation principle.

Taken together, these principles involve important trade-offs in terms of effectiveness and risk-taking. The objective of making liquidity freely available is constrained by the backstop principle, as high rates and features such as constructive ambiguity may feed stigma, discouraging institutions from drawing on liquidity support even when it is warranted. The inertia principle, in turn, inevitably entails risk taking by the central bank, although an important nuance is that these risks are at least partly endogenous to the central bank's own actions. As Bagehot famously observed, "the only safe plan is the brave plan". If liquidity provision at backstop prices is effective and a crisis is averted, LPLR operations will typically be profitable.¹⁴ Over time, different views have emerged regarding the appropriate balance between these principles (see Box 1).

¹² The separation principle has been defined in slightly different ways. Some have focused on the distinction between monetary policy stance determination versus implementing liquidity operations (ECB, 2008a; Borio, 2023); others on the separation between monetary policy and supervision (ECB, 2014a), or between monetary stance and financial stability objectives (Schnabel, 2023). Bindseil (2014) formulates the separation principle in organisational terms, distinguishing between a central bank's economics function (responsible for defining the desired monetary policy stance) and its markets function (which designs and executes the operations to achieve that stance). Under a strict separation principle, these functions can operate fully independent from each other.

¹³ The risk of misalignment is less problematic when a hybrid instrument is deployed in a sequenced manner, addressing market stress first and contributing to the monetary policy stance only thereafter, rather than pursuing both objectives simultaneously. An example of sequential implementation is the Fed's purchases of Treasury securities in 2020, which were initially launched to support market functioning and only later served to ease broader financial conditions (see Annex A).

¹⁴ Fleming and Klagge (2011) estimate that the Fed's interventions between August 2007 and December 2009 generated USD 13 bn income in excess of funding costs.

Box 1 Different views on the LPLR function of central banks

Different views have been developed on the scope the LPLR function and the trade-offs between the principles discussed in the main text.¹⁵ These views partly reflect broader perspectives on the role of a central bank in the economy, as well as differing opinions on the extent to which liquidity provision should rely on private markets rather than official sector intervention. The following approaches are ordered with increasing access to central bank funding:

- At one end of the spectrum is the **Free Banking school** which, in its most extreme form, assumes no role for a central bank at all. Private sector banks can issue their own money, with market discipline ensuring stability (see e.g. Selgin, 1988). Under this view, there is no LPLR role for a central bank.
- The **Richmond view** accepts that the central bank acts as a LPLR, but confines this role to open market operations.¹⁶ Bilateral lending operations such as ELA are not supported, as financial markets are considered a more efficient mechanism to allocate liquidity within the system. The reluctance to provide bilateral support may be interpreted as a strong reliance on the backstop principle.
- According to the **risk-taking view**, the LPLR should be prepared to assume significant risks during crises, even if the magnitude of those risks cannot be fully assessed ex ante. Buiter and Sibert (2007) argue that central banks must be willing to extend their operations to a much broader range of illiquid assets and markets than those accepted under normal monetary policy. Goodhart (1999) emphasises that, in practice, the LPLR cannot clearly distinguish between illiquidity and insolvency, implying that it should be prepared to respond to acute liquidity pressures even if there is doubt about solvency. The risk-taking view places less weight on the backstop principle and aligns more closely with, or even goes beyond, the inertia principle.
- **Full reserve banking** requires banks to hold central bank reserves against all (sight) deposits. One version is the Chicago Plan, which was developed in the 1930s and has been revived by Benes and Kumhof (2012). A less far-reaching approach is the **Pawnbroker for all seasons** proposal (King, 2016), under which all bank deposits must be backed by either central bank reserves or eligible collateral for central bank lending operations. Ex ante liquidity provision makes the backstop principle less relevant and blurs the separation between reserves creation for the LPLR function and other central bank tasks.

Across these perspectives, the relevance of a broad-based LPLR has likely increased over time as the financial system has expanded and become less bank-centric. In a purely bank-based system, both the Free Banking school and full reserve banking leave little or no role for a central bank as LPLR. In a broader financial system, however, systemically important markets and non-banks may also become dysfunctional, requiring intervention that goes beyond the mere creation of central bank reserves. A more market-based system also implies a larger role for open market operations, rather than bilateral LPLR support, which fits well with the Richmond view. Finally, the reduced emphasis on constructive ambiguity and the backstop principle is in line with the risk-taking view and ex ante liquidity provision.

¹⁵ See also Bordo (1990) and Tucker (2014) for discussions of different views on the lender of last resort.

¹⁶ Tucker (2014) labels this position the "Richmond view", as it has been promoted by economists of the Federal Reserve Bank of Richmond, notably Goodfriend and King (1988).

3 Recent trends in LPLR operations

In recent years, LPLR operations have evolved in response to successive crises and structural changes in the financial system (Graph 1 in Section 1). The onset of the GFC (2007–2009) triggered a sharp rise in liquidity demand and funding needs, requiring massive interventions by central banks. Additional LPLR operations were deployed during subsequent crises, particularly the European sovereign debt crisis (2010–2015) and the COVID crisis (2020–2021). Over time, the nature of operations has also changed, especially when these are compared with traditional ELA (Table 1). First, the scope of LPLR operations has

broadened to include NBFIs and a wider range of financial markets. Second, transparency around last-resort liquidity provision has increased, supported by more explicit communication and the formal integration of these instruments into central bank toolkits. Third, LPLR operations have become more closely intertwined with other policy domains, in particular monetary policy and financial regulation. This section discusses these three trends – broadening scope, greater transparency, and stronger interaction with other policies.

Table 1 Traditional versus recent LPLR (lending) operations

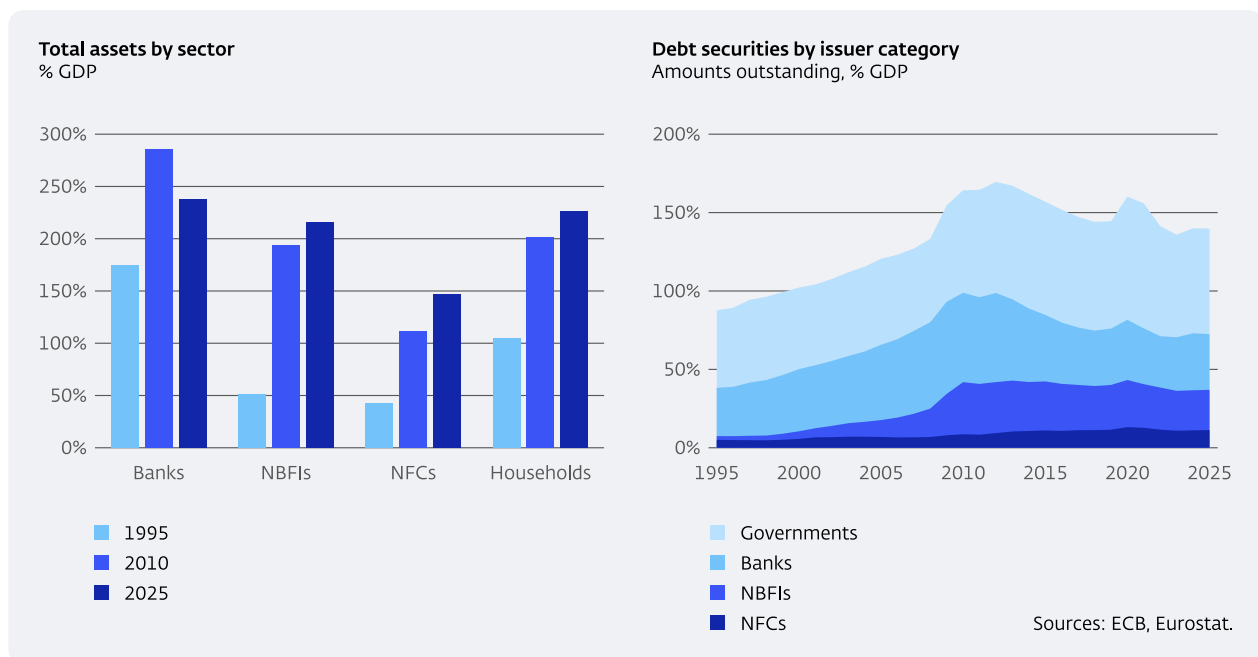
	Traditional ELA	Recent LPLR operations
Interest rate	Penalty rate	Closer to policy rate
Collateral	Ad hoc	Eligible for regular monetary operations
Counterparty scope	Bilateral	Market-wide or targeted
Duration	Short-term	Short to medium term
Governance	Ad hoc	Formal and clear
Stigma concerns	Very relevant	Modestly relevant
Moral hazard concerns	Very relevant	Modestly relevant
Communication	Unclear	Explicit
Interaction with monetary policy	Very limited	Important
Interaction with financial regulation	Very limited	Important

3.1 The broadening scope of liquidity provision

Financial systems have expanded and become less bank-centric, with a growing role of NBFIs and financial markets. Over recent decades, NBFIs have increased significantly in size and importance, while market-based finance has become more prominent. This trend is reflected in the growing stock of financial assets relative to the real economy (Graph 2 illustrates this for the

euro area). Key NBFI sectors are asset managers, money market funds, hedge funds and structured finance vehicles. In addition, specific entities such as Central Clearing Counterparties (CCPs) have emerged with a systemically important role, owing less to their balance sheet size than to their degree of interconnectedness.¹⁷ More recently, there have been developments in other dimensions, such as the emergence of tokenisation.

Graph 2 Expansion financial sector in the euro area



¹⁷ García-Pascual et al. (2025) discuss dimensions of systemic risk of NBFIs and financial markets, as well as central bank instruments to address market dysfunction and liquidity distress.

As a consequence, systemic considerations have become more important for central bank policies including LPLR operations. Financial stability has evolved into a core objective, as the financial system has become larger, more complex and more diverse.¹⁸ One manifestation of this shift is the growing importance of liquidity stress originating outside the banking sector. A systemic approach to the LPLR function therefore emphasises (1) market-wide liquidity provision rather than bilateral lending to individual institutions; (2) the acceptance of a broad range of collateral; and (3), where necessary, pricing close to the policy rate rather than at a punitive backstop rate. The goal of such operations is to stabilise system-wide liquidity conditions, with the liquidity-receiving counterparty primarily acting as a conduit to facilitate liquidity injections, rather than the ultimate beneficiary.¹⁹ To encourage effective participation, it is important that LPLR operations are free of stigma and avoid excessive penalty rates. As stigma typically intensifies during crises, central banks may temporarily increase the attractiveness of LPLR operations by lowering interest rates, easing collateral requirements or extending maturities.²⁰

Reflecting these developments, the scope of LPLR interventions has broadened to include NBFIs and financial markets. Such interventions can be indirect, with liquidity provided to banks that are expected to on-lend to stressed markets or non-bank counterparties. This channel can be reinforced by specific design features, such as pricing incentives linked to banks' lending to NBFIs, or collateral requirements targeting assets traded in particular markets or held by specific types of NBFIs. Alternatively, operations may be direct, through central bank lending to NBFIs or outright asset purchases in stressed markets, thereby acting as a MMLR. Box 2 presents a taxonomy to classify LPLR operations, ranging from bilateral emergency loans to purely market-focused interventions. The associated trade-offs and practical considerations are discussed further in Section 4.

¹⁸ Financial stability had already emerged as a central bank task before the GFC (Houben et al., 2004), but became more firmly embedded in policy mandates, policy instruments and organisational structures thereafter.

¹⁹ Liquidity-receiving counterparties can play this role by channelling liquidity to other players in the system, but also because their access to LPLR operations reduces incentives for liquidity hoarding.

²⁰ In this context, Bernanke (2015) describes the sequence of measures by the Federal Reserve in 2007 to mitigate stigma associated with the discount window. These measures initially focused on communication (that the discount window was open and available to all sound institutions), followed by a reduction in the primary credit rate spread (from 100 to 50 basis points relative to the federal funds rate target) and moral suasion (asking well-capitalized banks to make use of the facility). Later, the Term Auction Facility (TAF) was created, with specific design features (particularly its auction character and longer maturity) to make it less prone to stigma.

Box 2 The LPLR intervention spectrum: a taxonomy

The figure below presents a taxonomy of LPLR instruments, ranging from bilateral ELA to operations that are broader and target NBFIs and markets. Instruments are distinguished along three key dimensions: the definition of counterparties (bilateral, market-wide or none), assets involved (collateralised lending versus outright purchase) and the degree of recourse by the central bank (to the counterparty, the collateral or neither).

	ELA	Market-wide lending	Market-wide + targeted elements	Non-recourse	MMLR
Counterparty	Bilateral	Sector-wide	Sector-wide	Sector-wide	No
Collateral	Firm-specific	Broad	Broad or market-specific	Market-specific	No
Targeted elements	No	No	Yes	Yes	No
Recourse	Full	Full	Full	Only collateral	No
Outright purchase	No	No	No	No	Yes
	Institution-focused ← → Market-focused				

Moving top to bottom, operations become progressively less tied to specific institutions and more directly targeted to specific markets or market segments:

- **Traditional ELA** is fully institution-specific. Liquidity is provided bilaterally – typically to a bank – against collateral with full recourse to the counterparty.
- **Market-wide lending** operations provide liquidity through open market operations or standing facilities. Counterparties are broadly defined, and eligible collateral typically corresponds to that accepted in regular monetary policy operations but may be temporarily broadened to facilitate effective liquidity creation.
- **Targeted lending** operations are designed with an incentive to channel liquidity towards specific entities or markets. An entity-oriented design links access or pricing to lending behaviour, for instance through a funding-for-lending scheme such as the Eurosystem's TLTRO. A market-oriented design restricts eligible collateral to assets from a particular market or market segment in order to support market functioning (e.g. the Fed's TALF, supporting the ABS market by accepting ABS as collateral). Hybrid designs also exist, such as facilities targeting collateral held by a specific class of entities (e.g. the Fed's AMLF, supporting money market mutual funds by accepting their assets as collateral).

- **Non-recourse** operations constitute a special case of targeted lending. The central bank has no recourse to the borrowing counterparty and relies exclusively on the pledged collateral. Conceptually, this is equivalent to writing a put option on the collateral; relative to full-recourse lending, such operations therefore are closer to an outright asset purchase (Dobler et al., 2016). To compensate for the absence of counterparty recourse, relatively high collateral haircuts may be applied. The Federal Reserve has frequently made use of non-recourse operations (see Annex A).
- **Market-maker of last resort** represents the furthest step along the spectrum. By purchasing assets outright, the central bank intervenes directly in a market or market segment, providing liquidity support without reliance on counterparties or collateralised lending structures. To fully perform a market-making role, the central bank may also operate on both sides of the market by simultaneously quoting bid and ask prices, thereby supporting market liquidity and price discovery.²¹

3.2 More transparency

Central banks have become more transparent about LPLR provision, reflecting a broader push for transparency to strengthen accountability, credibility and independence. This is particularly evident for open market operations, both in terms of ex ante communication and ex post disclosure of take-up. Central banks typically publish detailed information about the design features of these operations, the volumes allotted or purchased and analytical evaluations of the programmes. LPLR standing facilities, by their nature, already exhibit a high degree of ex ante transparency, as counterparties must be fully informed about access conditions and pricing. Bilateral ELA operations are still generally kept confidential, although central banks increasingly disclose information on the underlying policies and procedures and – after some delay –

outcomes.²² Ex ante transparency on ELA can improve counterparties' preparedness, for instance by encouraging them to retain sufficient unencumbered eligible collateral, but it may also reduce the central bank's flexibility to tailor support to specific circumstances.²³

Over time, central banks have moved away from constructive ambiguity in liquidity provision and placed greater emphasis on reducing stigma.

While ambiguity was traditionally intended to deter moral hazard, experience during the GFC showed that it could exacerbate uncertainty and trigger destabilising liquidity outflows. Consequently, in their communication central banks have increasingly emphasised the availability of LPLR facilities as a systemic safety net. From this perspective, participation in LPLR operations is seen as supporting financial stability rather than signalling weakness (see Section 3.1).²⁴

²¹ To our knowledge, such two-sided MMLR-operations have been very exceptional. An example is the Bank of England's Corporate Bond Secondary Market Scheme, which was launched in 2009. See Simon (2020).

²² An example of increased interest in central bank transparency in general is the IMF's Central Bank Transparency code (International Monetary Fund, 2020), which includes detailed features on various central bank tasks including liquidity support and is a significant extension to a previous transparency code from 1999. The ECB started publishing rules and proceedings regarding ELA provision by the Eurosystem in 2013, which has recently been updated (ECB, 2024). The Fed has gone a step further by publishing borrower-specific information on discount window usage since 2010, with a two-year lag.

²³ See Dobler et al. (2016) for a further discussion on the pros and cons of ex ante and ex post information provision of ELA operations and BIS Committee on the Global Financial System (2017) for a similar discussion for LOLR lending operations more generally.

²⁴ Stigma concerns tend to be persistent, however. Armentier et al. (2024) show that stigma remains a relevant constraint on usage of Fed's discount window despite modifications intended to promote access.

3.3 Interaction with other policy fields

Since the GFC, central bank liquidity provision increasingly interacts with monetary policy and financial regulation. On the liquidity supply side, abundant reserves have been created as a by-product of large-scale monetary operations and more attractive conditions of central bank lending operations. Although these extensive operations have been partly unwound in recent years, liquidity conditions are widely expected to remain ample (as will be discussed below). On the liquidity demand side, banks' preference to hold central bank reserves has structurally increased and has become less predictable. This reflects the introduction of post-GFC liquidity regulation as well as banks' own experiences during successive episodes of financial stress, which have strengthened precautionary motives for holding reserves.

LPLR operations may also interact with policy areas beyond the central banks' core remit, notably fiscal policy. LPLR interventions in sovereign debt markets, for instance, can be highly consequential for governments. To mitigate distorted incentives and the risk of fiscal dominance, such interventions should be confined to cases of clear market dysfunction, for example when sovereign spreads rise significantly above levels justified by fundamentals. Similar issues arise when LPLR operations work alongside government measures, such as recapitalisations of systemically important institutions. In such cases, the central bank should in principle remain focused on providing liquidity to solvent institutions. The remainder of this section concentrates on interactions with policy domains for which central

banks themselves often bear direct responsibility: monetary policy and financial regulation.²⁵

3.3.1 Liquidity creation and monetary policy
Before the GFC, several central banks operated under tight liquidity conditions and adhered to the separation principle (Section 2). A strict distinction was maintained between liquidity creation and the determination of the monetary policy stance. LPLR operations were therefore conceptually different from, and not intended to interfere with, monetary policy aimed at price stability. In practice, this often implied that LPLR operations were sterilised. The ECB was particularly explicit in its communication about the importance it attached to this principle.²⁶

Since the GFC, however, unconventional policy measures have increasingly blurred the separation between liquidity creation and monetary policy. During the early crisis years (2007-2009), central banks deployed a broad set of LPLR operations. Initially, these were primarily motivated by stabilisation objectives: ensuring liquidity and preserving monetary transmission. They were not designed to directly influence the monetary policy stance. In subsequent years, however, central banks introduced unconventional instruments that were explicitly intended to directly ease the monetary stance. Large-scale asset purchase programmes (quantitative easing) are the most prominent example, implemented over several years to compress term premia and reduce long-term interest rates. Another example is funding-for-lending schemes (such as the Eurosystem's TLTROs), aimed at supporting bank credit to the real economy. While these

²⁵ Central banks' responsibility for financial regulation and supervision differs across jurisdictions. Houben et al. (2022) provide an overview of central banks' involvement with micro and macroprudential supervision and resolution in advanced economies.

²⁶ See e.g. ECB (2008a), Trichet (2008) and Rostagno et al. (2019). A further illustration of separation is that, while it was implementing several LPLR measures, the ECB tightened its monetary stance in 2011 by increasing its main policy rates.

instruments cannot be classified as (pure) LPLR operations, they nonetheless resulted – by design or as a by-product – in substantial liquidity creation and more favourable funding conditions. As a consequence, the separation principle – understood as a strict distinction between liquidity creation and steering monetary policy stance – became increasingly difficult to uphold.²⁷

Looking ahead, several central banks have announced that they intend to continue

operating with ample reserves in normal times (Box 3). Although liquidity volumes are gradually declining as unconventional measures are phased out, a return to the pre-GFC scarce liquidity is widely viewed as neither feasible nor desirable. Banks' demand for reserves has become structurally higher and more volatile due to regulation and structural changes in the financial system, undermining the effectiveness of operating frameworks that rely on precise liquidity forecasting and fine-tuning operations.

Box 3 New operational frameworks, liquidity creation and the separation principle

Before the GFC, advanced-economy central banks typically operated under tight, or “balanced” liquidity conditions, supplying only the liquidity needed to offset autonomous factors and meet minimum reserve requirements. The Eurosystem’s corridor system was a typical example: aggregate reserve needs were met through weekly repo operations (MROs), while banks absorbed idiosyncratic shocks via the interbank market and reserve averaging. As a result, excess reserve demand was negligible outside stress periods. This framework was fully consistent with the separation principle, with reserve creation tightly linked to steering short-term money market rates.²⁸

Since the GFC, central bank balance sheets have expanded markedly as a result of unconventional policies, leading to large-scale reserves creation. At the same time, central bank reserves became increasingly important for banks seeking to comply with post-GFC liquidity regulation, most notably the liquidity coverage ratio (LCR). In many jurisdictions, these developments led to a de facto shift from “scarce-liquidity” corridor systems to “abundant-liquidity” floor systems in which the remuneration on excess reserves became the main anchor for money market rates and thus the effective policy rate. Importantly, remuneration on excess reserves in such systems was close to the overnight money market rate, making banks’ opportunity cost of holding reserves very low.

In recent years, central banks have started to reduce the size of their balance sheets by unwinding large-scale asset portfolios (i.e. quantitative tightening) and extraordinary lending operations, gradually absorbing excess reserves. Even so, several central banks have made clear that they do not intend to return to pre-GFC scarce-reserve regimes. Instead, operating frameworks will continue to rely on ample reserves, reflecting banks’ persistently higher and more volatile demand for reserves for prudential and precautionary reasons.

²⁷ See Bordes and Clerc (2013) and Rostagno et al. (2019).

²⁸ Arguably, the only inherent functions of reserves creation were to facilitate payment systems, which require a limited and predictable volume, and to meet increased liquidity demand in periods of stress.

The table below summarises new operational frameworks announced by several central banks in recent years. The Federal Reserve and the Swiss National Bank have opted for “supply-driven” systems in which reserves supply exceeds banks’ demand by a wide margin and money market rates are anchored at the floor rate. By contrast, the Eurosystem, the Bank of England, the Bank of Canada and the Reserve Bank of Australia are moving towards “demand-driven” frameworks. In these systems, the marginal supply of reserves is determined endogenously through banks’ use of full-allotment lending operations at fixed and (nearly) market-consistent rates.²⁹ Finally, the Riksbank intends to retain a corridor system, albeit with some demand-driven features.³⁰

Central bank	Operational framework
Federal Reserve System	Floor system, supply-driven
Swiss National Bank	
Eurosystem	Floor system, demand-driven
Bank of England	
Bank of Canada	
Reserve Bank of Australia	
Riksbank	Corridor system, demand-driven

Note: operational frameworks as announced in recent central bank publications

Under ample-liquidity frameworks, the separation between reserve creation for monetary policy implementation and for accommodating banks’ demand for reserves is blurred. Especially in demand-driven systems, reserve creation is largely endogenous, reflecting by banks’ recourse to lending operations.³¹ In periods of market stress, take-up in such operations is expected to increase as banks seek to meet rising demand for reserves. Against this backdrop, the LPLR function in times of stress is likely less about the creation of additional reserves per se and more about the targeted provision of liquidity to specific sectors or financial market segments.

²⁹ See Schnabel (2024) on the ECB’s new demand-driven framework; Perli (2025) on the Fed’s framework; Bank of England (2024) on its framework; Gravelle (2024) on the Bank of Canada’s framework; Kent (2024) on the Reserve Bank of Australia’s framework; Hansson and Johansson (2023) on the Riksbank’s framework; and Böser et al. (2024) for a comparison between the frameworks of the ECB, Fed, Swiss National Bank, Bank of England and the Riksbank.

³⁰ The Riksbank applies a relatively narrow corridor between lending and deposit rates (20 basis points), keeping the opportunity costs for borrowing low relative to classic pre-GFC corridor systems. In addition, autonomous factors and legacy asset holdings create a liquidity surplus, which is absorbed through weekly issuance of debt certificates. As take-up reflects banks’ reserve demand, this introduces a demand-driven element. See Hansson and Johansson (2023) for a discussion of the Riksbank’s framework.

³¹ Under supply-driven systems, reserve creation is determined by the central bank rather than endogenously through banks’ take-up of lending operations. The resulting outcomes may nonetheless be very similar, provided that reserve supply is sufficiently ample to accommodate demand at rates close to overnight money market rates, thereby keeping the opportunity cost of holding reserves low. Cavallino et al. (2025) develop a taxonomy of operational frameworks and conclude that these can produce broadly similar outcomes.

3.3.2 Liquidity demand and financial regulation

Recent changes in financial regulation have significantly affected banks' demand for central bank reserves. In response to the GFC, the Basel 3 package introduced quantitative liquidity standards, most notably the liquidity coverage ratio (LCR). The LCR requires banks to hold sufficient high-quality liquid assets (HQLA) to withstand a severe but plausible cash outflow in a stress scenario.³² Central bank reserves qualify as HQLA (to the extent that they are freely withdrawable) and can therefore be used to meet the LCR requirement. Moreover, reserves can be regarded as more liquid than other HQLA, such as government bonds. While bonds have to be monetised – potentially under stressed conditions – to generate cash, reserves are immediately available. As a result, although the LCR standard does not formally discriminate between reserves and other Level 1 HQLA (government bonds), banks often have an internal preference to hold part of their liquidity buffer in the form of central bank reserves. This preference may be reinforced by internal liquidity risk management metrics that place a premium on assets with minimal

operational and market liquidity risk. The extent to which banks rely on central bank lending operations to source reserves depends critically on their design features – most notably the pricing and collateral requirements – and the presence of potential stigma.

Banks' reserves holdings may remain limited in normal times if access to central bank operations in a crisis is perceived as reliable and stigma-free. Indeed, several central banks have adapted their operational frameworks to ensure such ready access. Provided that banks have mobilised sufficient eligible collateral, they can rapidly scale up their reserve holdings by participating in regular central bank operations. Authorities can reinforce this by imposing minimum operational readiness requirements related to access to such operations, for example through regular testing and the pre-positioning of eligible collateral, calibrated to a bank's stock of highly liquid (or "runnable") liabilities (Coelho et al., 2024). Such requirements reduce frictions in liquidity provision during stress, while potentially limiting the need for banks to hold large precautionary reserve balances in normal times.

³² Another Basel 3 liquidity standard is the net stable funding ratio (NSFR), which requires banks to maintain sufficient stable funding relative to their liquidity risk profile. LPLR and other lending operations can be particularly attractive if they have a remaining maturity of at least six months, as they may then partly qualify as stable funding. We do not discuss the NSFR further in this study.

4 The LPLR in practice: considerations and trade-offs

The implementation of LPLR operations involves several considerations and trade-offs.

First, central banks can draw on a broad set of instruments, with the appropriate choice depending on the nature of the stress, as well as on legal and operational constraints and practical factors such as time pressure. Second, LPLR instruments are rarely deployed in isolation; instead, they typically form part of a broader package of measures, which needs to be internally consistent and mutually reinforcing. Third, the design and activation of LPLR instruments should incorporate exit considerations from the outset, ensuring that support can be withdrawn smoothly once conditions normalise. This section discusses these considerations and trade-offs, illustrating them with past cases.

4.1 Selecting the most efficient instrument

The choice of the most appropriate instrument depends on the nature of the stress, as well as on prevailing legal and operational constraints.

Instruments must have sufficient legal basis and require a high degree of operational readiness. An important starting point is therefore the LPLR's monetary policy implementation framework in normal times, including the set of eligible counterparties and the collateral framework. Within these constraints, the LPLR typically retains a broad set of options (see Box 2 and Annex A). The Bank of England's intervention in the gilt market in October 2022 illustrates the trade-offs between these options. According to its own evaluation,

the Bank would have preferred to provide targeted liquidity support to Liability-Driven Investment (LDI) funds through a lending operation, but such an operation was not deemed effective (Hauser, 2022). As a result, it had to intervene through purchases of long-term gilts to restore market functioning.³³

Another consideration concerns the choice between designing a new, situation-specific instrument versus relying on existing tools.

Tailor-made instruments may be more effective in directly addressing the problem at hand but typically require time to design and prepare. For lending operations, this involves features such as collateral eligibility, pricing, maturity and counterparty access. Asset purchases also require preparatory work, particularly if they target market segments in which the central bank is not normally active. Proactive instruments addressing well-anticipated events, such as the Y2K transition or the launch of the euro, can typically be designed most extensively. By contrast, LPLR operations responding to sudden and unexpected shocks must often be implemented rapidly and under considerable uncertainty, leaving little scope for the development of new instruments. Accordingly, when the COVID crisis erupted early 2020, many central banks responded primarily by activating, extending or recalibrating existing operations, rather than designing entirely new ones. For the ECB, this included extending the TLTRO 3 lending operation that had been launched a few months earlier; the Fed launched several operations that were closely modelled to instruments implemented during the GFC (see Annex A for a more detailed discussion).

³³ Early October 2022, spreads in long-term gilts spiked which put LDI funds – which were highly leveraged and had large exposures to this market segment – in a vulnerable position. To limit exposure to further rises in yields, LDI funds began selling their gilts, causing a self-reinforcing spiral that pushed up yields even further. As a private sector solution was not possible, the Bank of England had to step in to sustain market functioning and counteract excessive yields. Lending operations targeting LDI funds – either directly or via banks – would be counterproductive because that would further increase the LDI funds' leverage. As the Bank of England had to act fast, a purchase programme targeting the long-term gilt segment was the only feasible option. See Hauser (2022) for a more detailed discussion.

Central banks also face a trade-off between launching concise versus large-scale operations.

A concise operation may help limit side-effects and facilitate a timely exit, while retaining the option to scale up if necessary. During the turmoil in US money markets in August 2007, for example, the Fed initially eased discount window conditions – lowering the rate, extending maturities – and used moral suasion to counter stigma. When these measures proved insufficient, the Term Auction Facility (TAF) was introduced as a new, more forceful tool.³⁴ By contrast, a potentially large or unlimited operation may be preferred when a strong signal of commitment is required to deter market speculation. Prominent examples are the ECB’s adoption of fixed-rate full allotment tenders in 2008 and the announcement of Outright Monetary Transactions (OMT) in 2012, accompanied by the pledge to do “whatever it takes”. When such announcements are credible, the actual size of the operation may remain limited.

Another “size” dimension concerns the duration of LPLR operations, which can be fixed or open-ended. In certain cases, a predefined time horizon can strengthen incentives for market participants to adjust. The Bank of England’s gilt market intervention in 2022 illustrates this point: available market intelligence at the time suggested that a two-week window would suffice for LDI funds to make arrangements with pension funds to restore their liquidity positions (Hauser 2022).³⁵

This clearly defined time frame accelerated private sector adjustment and contributed to the operation’s effectiveness (Pinter et al., 2024). In situations characterised by high uncertainty, however, longer-term or open-ended operations may be warranted to demonstrate the LPLR’s commitment to liquidity provision and to restore confidence in the market.

4.2 LPLR instruments as part of a broader package

LPLR interventions are often deployed as part of a broader package of central bank measures.

Several such examples are discussed in Annex A. In 2014, for instance, the ECB launched three programmes – TLTRO1, the ABSPP and CBPP3, all of which we classify as hybrid tools – with the aim of supporting bank funding conditions and stimulating bank lending. These operations were mutually reinforcing: the asset purchase programmes (ABSPP and CBPP3) supported banks’ funding markets, while TLTRO1 helped ensure that the resulting funding relief was passed on to borrowers (Rostagno et al. 2019). Another example concerns the Fed’s purchase programmes that were implemented in 2020 to support primary and secondary bond markets: the PMCCF and the SMCCF, respectively. Although actual purchases were conducted only in secondary markets under the SMCCF, the PMCCF nonetheless played an important role as a backstop against rollover risk. Together, these programmes were an integral part of the Fed’s comprehensive response to market stress during the COVID crisis.

³⁴ See Bernanke (2015) for a discussion of the main considerations regarding implementation of these tools. See also Annex A.

³⁵ In addition, keeping the intervention period limited was desirable in order not to interfere with the already planned unwinding of the Bank of England’s QE portfolios (Hauser, 2022).

LPLR instruments may also be coordinated

across central banks. The most prominent examples are FX swaplines between central banks, which facilitate the provision of liquidity in foreign currencies. Dysfunctional USD funding markets during both the GFC and the COVID crisis not only affected US banks, but also banking sectors outside the US, where central banks have very little capacity to provide dollar liquidity. Swaplines with the Federal Reserve enabled other central banks – including the Eurosystem – to offer dollar facilities to their own banks. These arrangements were very effective to alleviate funding pressure and support market recovery. In general, swaplines enhance central banks' firepower as they can only create unlimited liquidity in their own currency, while also sending a strong signal to financial markets. From a US perspective, swaplines can be viewed as a cross-border extension of domestic liquidity tools, helping to mitigate market stress at home.³⁶

Finally, central banks' LPLR interventions are often complementary to policies implemented by the government or other authorities.

While central banks typically focus on liquidity, governments can provide funding guarantees or inject capital into financial institutions.³⁷ At the same time, prudential authorities may adopt measures such as a temporary relaxation of regulatory requirements, further reinforcing the overall policy response.³⁸

4.3 Exit considerations

A smooth exit from LPLR operations is important to avoid cliff effects. Abrupt withdrawal may trigger renewed disruptions if markets are not yet fully functional. One mechanism to support an orderly exit is backstop pricing, as improving market conditions will naturally push market rates below the backstop rate, thereby reducing the attractiveness of the operation. Clear ex ante communication about the operation's intended duration can further facilitate an orderly exit. More formally, the inclusion of a sunset clause specifying when favourable conditions expire can create incentives for market participants to adjust their behaviour in a timely manner (see also Section 4.1 on the duration of operations, and the Bank of England's intervention in the gilt market). Finally, adherence to the separation principle may help prevent situations in which instruments serving multiple objectives are withdrawn while not all these objectives have been fully achieved.

³⁶ This was particularly relevant for the Fed's Term Auction Facility (TAF), which was launched in 2007. Other central banks used the swapline with the Fed to provide a similar facility to their own banks, which helped to calm overall stress in USD markets.

³⁷ The government may also support central bank operations through the provision of guarantees and by granting formal approval. Particularly in the US, several central bank LPLR operations have been backed by government guarantees to cover part of the potential losses. Moreover, under the Dodd Frank Act (2010), the Fed is required to obtain approval from the US Treasury for emergency liquidity provision under Section 13(3); see Annex A for a further description and illustrative examples.

³⁸ Examples of regulatory measures that were eased for European banks during the COVID crisis in 2020 include the release of countercyclical capital buffers, a temporary allowance to operate below the LCR requirement and a temporary exclusion of banks' exposures to the central bank from leverage ratio requirements (ECB, 2020a, 2020b). Regulators in other jurisdictions adopted similar measures.

5 Conclusions and future challenges

This study explores recent trends in LPLR provision: a broadening of its scope, greater transparency, and increasing interaction with other policy domains. The broadening scope is reflected in the growing importance of NBFIs and market-based finance, alongside a relative decline in the role of banks. Increased transparency mirrors a broader trend in central banking, with communication playing an increasingly prominent role as a policy tool. Finally, the increased interaction with other policy fields reflects that central bank liquidity creation has become a core element of new operational monetary implementation frameworks as well as prudential liquidity regulation.

These trends are ongoing and carry important implications for the scope and the design of LPLR operations. In line with recent experience, last-resort liquidity provision should be defined broadly and conceived as a system-wide function. Long-standing principles – most notably the backstop, inertia and separation principles – remain highly relevant but call for reinterpretation in light of structural changes in the financial system and in central bank operating frameworks.

Against this background, three key challenges stand out for the coming years:

- **Growing liquidity provision to NBFIs.** The importance of NBFIs and market-based finance is likely to continue increasing, potentially expanding into new areas such as the tokenisation of assets. In recent years, some central banks – most notably the Federal Reserve and the Bank of England – have extended direct access to central bank operations beyond the banking sector.³⁹ Looking ahead, however, it is conceivable that central banks will face stronger incentives to enhance their capacity to provide liquidity to NBFIs.

- **Strengthening operational readiness to rapidly scale up liquidity provision.** Recent crisis episodes, including the COVID shock and the banking turmoil in 2023, highlight the critical importance of being able to expand liquidity provision swiftly. From the central bank perspective, readiness is enhanced by maintaining a broad and well-functioning operational toolkit in normal times, which can be activated or expanded in times of stress. Regular maintenance and testing of these operations are essential to ensure their effectiveness as financial structures and market practices evolve. From the perspective of financial institutions, preparedness hinges on reliable access to central bank facilities, supported by routine testing and the maintenance of sufficient eligible collateral.
- **Reformulation of the separation principle and avoiding hybrid instruments.** A clear separation between last-resort liquidity provision and other policy objectives remains a cornerstone of effective central banking. Historically, the separation principle served to delineate reserves creation from policies aimed at steering the monetary stance. However, changes in monetary implementation frameworks and financial regulation have blurred this distinction. A renewed formulation of the separation principle may therefore move beyond a narrow focus on reserves creation but define separation in terms of the purpose of instruments: steering monetary conditions versus addressing financial stress and market dysfunction (see e.g. Knot, 2025). From this perspective, the use of hybrid instruments warrants caution, as simultaneously pursuing stabilisation and monetary policy objectives may blur accountability and complicate policy implementation.

³⁹ The Fed has given primary dealers access to its Standing Repo Facility since 2021, which is a BAU facility (and therefore not in our scope) but nonetheless an example of direct access of NBFIs to a credit operation. During the GFC and COVID crises, the Fed designed instruments targeting NBFIs indirectly via banks (particularly the MMLF, PDCF – see Annex A). In 2025, the Bank of England launched its Contingent Non-Bank Institution Repo Facility (CNRF), which allows direct liquidity provision specific categories of NBFIs, and can be activated during periods of market stress.

Annex A

LPLR operations by the Eurosystem and the Federal Reserve

This annex presents an overview of LPLR operations in the euro area and the United States over the past three decades. This period includes multiple episodes of acute market stress as well as situations where potential stress was anticipated but did not ultimately materialise. We focus on central bank operations aimed at alleviating liquidity shortages and addressing market dysfunction. We exclude operations that can be considered business as usual, operations aimed solely at steering the monetary policy stance (such as liquidity-providing operations to control interest rates and quantitative easing programmes intended to compress the term premium), as well as foreign exchange interventions.

Inevitably, the interpretation and classification of these operations involve certain caveats:

First, **the delineation of what constitutes a distinct instrument is not always straightforward**. Some tools have explicitly been designed and implemented to address episodes of market dysfunction. In other cases, the instrument consists of a more general mandate or legal capacity that enables the central bank to act (e.g. provide emergency lending) or where the intervention involves scaling up an already existing operation. In addition, certain instruments have been announced but not (yet) implemented; such announcements may be effective if markets internalise that the instrument forms part of the central bank's available toolkit.

Our approach: we treat standing facilities with an LPLR function (such as the Fed's discount window and the Eurosystem's Marginal Lending Facility) as well as the central bank's general powers to provide bilateral emergency loans, as permanent tools. The use of these tools vis-à-vis individual counterparties is therefore not considered as a separate operation. By contrast, cases where existing instruments are scaled up are interpreted as LPLR operations if these are clearly a response to (such as the actions following the 9/11 attacks) or anticipation of (such as the Y2K preparations) potentially major disruptions to market functioning. Finally, instruments that have been announced but not implemented are included as relevant LPLR operations, if the announcement itself was intended as a signal to calm markets – an example being the Eurosystem's Transmission Protection Instrument (TPI) that was announced in 2022.

Second, there are **hybrid instruments** that combine an LPLR motive with other (typically monetary stance-related) objectives. Prominent examples include the Eurosystem's TLTROs, as these were intended to support bank funding (LPLR) as well as to stimulate lending to the real economy (stance). Similarly, asset purchase programmes launched by the Eurosystem (PEPP) and the Fed (Treasury, MBS) in March 2020 initially aimed primarily at restoring monetary transmission and market functioning. At later stages, however, the emphasis shifted towards easing broader financial conditions and supporting the monetary policy stance.

Table A1 Pure versus hybrid LPLR operations: average peak use

	Euro area	United States
All LPLR operations	EUR 406 bn	USD 379 bn
Pure LPLR operations	EUR 175 bn	USD 184 bn
Hybrid operations	EUR 906 bn	USD 1452 bn

Source: Tables A2 and A3

Table A1 shows that the average peak size of hybrid operations has been several times larger than that of pure LPLR measures in both the euro area and the US. This is intuitive: pure LPLR instruments can be effective as a backstop and stabilise markets with little or no take-up. In contrast, instruments aimed at influencing the monetary policy stance typically require large scale and persistent implementation to exert a meaningful macroeconomic impact.

Our approach: we include such hybrid tools explicitly and describe the rationale for classifying them as such, recognising that their objectives and dominant motivations may evolve over time. That said, we probably understate the extent to which instruments have been designed with more than just an LPLR objective.

Third, operations are often embedded in a **broader package** of LPLR measures or, more generally, in a wider set of government actions.

Our approach: we document and describe each operation separately but, where relevant, also the broader context in which it was deployed, particularly other central bank operations or government actions that should be considered complementary.

Finally, **our classification of operations into different types** (ranging from bilateral lending to asset purchases – see Box 2) is not always clear-cut and requires judgement. For instance, the Federal Reserve has operated purchase programmes under Section 13(3) of the Federal Reserve Act through special purpose vehicles (SPVs). Technically, such programmes could be considered lending operations (with the Fed extending a loan to the SPV). But if the intention clearly is to acquire specific assets through the SPV, we classify these operations as asset purchase programmes.

Our approach: we make our interpretative choices explicit and explain, in relevant cases, the reasoning underlying our classification.

This annex draws on a wide range of information sources. These include official announcements, technical documentation and analytical assessments by the central banks themselves. Other useful sources include international organisations (BIS, IMF, World Bank) as well as dedicated databases such as the New Bagehot Project (<https://newbagehot.yale.edu/>). In addition, we draw on individual publications such as Domanski et al. (2014), Rostagno et al. (2019), Buiter et al. (2023) and Kakes et al. (2022).

A.1 Overview of LPLR operations by the Eurosystem

Table A2 presents an overview of LPLR instruments implemented by the Eurosystem, classified according to the taxonomy presented in Box 2.

The Marginal Lending Facility and Emergency Liquidity Assistance are classified as permanent tools:

- The **Marginal Lending Facility (MLF)** is a standing facility for overnight credit, which banks can always resort to at their own initiative and at a backstop rate. In the first decade of the euro, when the Eurosystem operated a symmetric corridor system, the MLF also played an important business-as-usual role. Together with the deposit facility and standard refinancing operations, it helped keep overnight money market rates close to the main policy rate. Since the transition to a (de facto) floor system, however, the MLF largely lost this regular role and has evolved into a pure last-resort backstop facility.

- **Emergency Liquidity Assistance (ELA)** is provided by the Eurosystem's national central banks (NCBs) to domestic institutions facing temporary liquidity shortages. Although ELA is primarily a national, rather than Eurosystem-wide task, its provision is constrained by the ECB's ELA agreement (ECB, 2024). This agreement specifies the conditions under which ELA provision may be granted, including solvency criteria, collateral standards, the prohibition of monetary financing, information sharing obligations vis-à-vis the ECB and limits on duration and pricing. ELA must be extended at a backstop rate of at least 100bps above the MLF rate.

The Eurosystem **temporarily narrowed its interest rate corridor** when the euro was launched on January 1st, 1999. This was a precautionary measure, effective between 4 January and 21 January 1999. Its objective was to ensure that money market interest rates could not deviate excessively from the main policy rate (the MRO rate in this period) should the newly created euro money market fail to function smoothly in its initial phase. The Eurosystem's operational system had (and still has) three policy rates: the MRO rate (the main policy rate) and rates on two standing facilities: the MLF for backstop liquidity (see above) and the deposit facility for any reserves banks would hold beyond the minimum reserve requirement. Under normal conditions, the MLF rate and the DFR were set 100 basis points above and below, respectively, the MRO rate, forming a symmetric corridor. During the temporary corridor narrowing in January 1999, however, the spreads of both standing facilities were reduced to 25 basis points, tightening the corridor around the MRO rate. For more information, see the announcement on 22 December 1998 (ECB, 1998).

The Eurosystem **temporarily adjusted the maturity of its lending operations ahead of the millennium changeover (Y2K)**, as a precautionary measure. In September 1999, the ECB announced that the maturity of two weekly Main Refinancing Operations (MROs) conducted at end-December 1999 would be extended from one to three weeks. In addition, the redemption date of a Long-Term Refinancing Operation (LTRO), which would normally have matured on 30 December, was brought forward to 23 December. These measures ensured that no Eurosystem lending operations matured in the days surrounding the Y2K data change. For more information, see the [announcement of the measures on the ECB website](#) (ECB, 1999) and the [ECB Monthly Bulletin of January 2000](#) (ECB, 2000).

Following the 9/11 terrorist attacks on the Twin Towers in New York, the Eurosystem responded with two operations to safeguard the functioning of money markets and address potential liquidity strains:

- An immediate **fine-tuning operation** to inject euro liquidity through a tender operation on 12 September 2001 with a fixed rate and full allotment. The operation allowed counterparties to borrow any amount against eligible collateral at a pre-announced rate. See for more information the [announcement on the ECB website](#) (ECB, 2001a) and the [ECB Monthly Bulletin of October 2001](#) (ECB, 2001b).
- A **currency swap operation** with the Federal Reserve on 12 September 2001 to secure the availability of US dollar liquidity for the Eurosystem. These funds could subsequently be provided to European banks facing urgent dollar needs. For more information, see the [announcement on the ECB website](#) (ECB, 2001c) and [French \(2023a\)](#).

During the Global Financial Crisis (GFC), the Eurosystem adopted a broad set of measures to address liquidity stress and disruptions in bank funding markets:

- A **fine-tuning operation** to inject liquidity in the money market was conducted on 9 August 2007, in response to acute tensions. This took the form of a quick tender with a one-day maturity, followed by additional liquidity-providing operations over subsequent days, which gradually declined in volume as conditions stabilised. See for more information the [ECB Monthly Bulletin of September 2007](#) (ECB, 2007a).
- The provision of **USD tenders** was announced on 12 December 2007, following a coordinated action with the Federal Reserve and other major central banks to establish reciprocal swaplines. The resulting USD lending operations were conducted in conjunction with the Fed's Term Auction Facility (TAF), against ECB-eligible collateral and at a fixed rate equal to the marginal rate of the corresponding Fed operation. Although initially only two tenders were announced, the Eurosystem continued to offer regular USD operations in subsequent years under the swapline arrangement. See for more information the [announcement of on 12 December 2007](#) (ECB, 2007b) and [French \(2023b\)](#).
- To support the normalisation of money market functioning, **six-month lending operations** (6M LTROs) were announced on 28 March 2008. These operations were conducted as variable rate tenders with the main policy rate serving as the minimum bid rate. They also reflected a broader shift towards the provision of longer-term lending operations, which had started earlier with an increased frequency of three-month operations from August 2007. See for more information the [announcement on 28 March 2008](#) (ECB, 2008b).

- An major step was a change in tender procedures, announced by the ECB on 8 October 2008, moving to a **fixed rate full allotment** (FRFA) framework for its weekly Main Refinancing Operations (MROs). This change eliminated both price and quantity uncertainty for counterparties, granting banks unlimited access to central bank reserves at a known rate. At the same time, the ECB narrowed the interest rate corridor defined by its two standing facilities (the MLF and DF) from 200bps to 100bps.⁴⁰ For more information, see the [announcement on 8 October 2008](#) (ECB, 2008c).
- **One-year lending operations** (1Y LTRO), announced on 7 May 2009, were conducted as FRFA operations at the main policy rate (i.e. no backstop pricing). These operations were intended to ease bank funding conditions. See for more information the [announcement on 7 May 2009](#) (ECB, 2009a).
- The **Covered Bond Purchase Programme** (CBPP1), announced on 7 May 2009, was the Eurosystem's first outright asset purchase programme. Under the CBPP1, the Eurosystem purchased covered bonds issued by banks in order to revive this market segment, which had been significantly impaired during the crisis. For more information, see the [announcement on 7 May 2009](#) as part of a press conference by ECB president Trichet (ECB, 2009b), the publication of [further modalities on 4 June 2009](#) (ECB, 2009c), and [Smith \(2020a\)](#).

In the years following the 2007-2009 GFC, the Eurosystem intervened repeatedly to contain the European sovereign debt crisis. Over time, these interventions increasingly took on a hybrid character, combining market-stabilisation and transmission-repair objectives with elements aimed at easing financial and monetary conditions:

- A **reactivation of USD tenders**, linked to swaplines with the Fed, was announced on 10 May 2010 as a response to strains in USD funding markets in Europe. These strains were related to the emerging sovereign debt crisis. The reactivation of USD tenders was part of a package to support monetary transmission, which also included the SMP (see below) and a six-month refinancing operation. USD tenders were initially offered at a relatively high backstop rate of 100bps above the OIS rate, leading to limited take-up (about USD 9 bn peak volume). In November 2011, the operation was made more attractive by reducing the surcharge above the OIS from 100bps to 50bps, leading to a much higher take-up (around USD 90 bn peak volume). Later on, the USD tenders became a regular weekly operation with fixed rates and full allotment; during the COVID crisis, the tenders were temporarily offered against more attractive conditions to mitigate market stress (which we consider a separate LPLR action – see below). For more information, see the announcement of the USD liquidity providing operations (ECB, 2010a) and the broader package (ECB, 2010b) and a more general background article by [French \(2023c\)](#).

⁴⁰ FRFA has remained a design feature of MROs and continues to be so today. Over time, however, its functional role has changed. For most of the post-GFC period, take-up in MROs was very limited, reflecting the abundance of excess reserves created by other, often large-scale, liquidity-providing operations. As a result, the Eurosystem's operational framework gradually shifted from a corridor system to a (de facto) floor system, with the MRO effectively serving as a backstop operation rather than an active marginal source of liquidity. In the current "demand-driven" operational framework, announced in 2024 (Schnabel, 2024), FRFA remains a permanent feature of standard lending operations, anchoring banks' access to central bank liquidity on demand.

- Under the **Securities Markets Programme** (SMP), announced on 10 May 2010, the Eurosystem purchased sovereign bonds issued by euro area countries affected by the European sovereign debt crisis. Initially this included Greece, Ireland and Portugal; purchases were later extended to Italy and Spain. The primary objective was to address market dysfunction and safeguard the transmission of monetary policy. To avoid altering the monetary policy stance, liquidity created by the purchases were fully sterilised. For more information, see the [announcement on 10 May 2010](#) (ECB, 2010b) and [Smith \(2020b\)](#).
- The second **Covered Bond Purchase Programme** (CBPP2), announced on 6 October 2011, was aimed to ease funding conditions for credit institutions and enterprises, and thereby support lending. While the reference to stimulating lending could be interpreted as a stance-related objective, we assess CBPP2 primarily as a stabilisation measure, consistent with CBPP1. This interpretation is reinforced by the fact that the subsequent third covered bond programme (CBPP3) was explicitly introduced with a different, broader purpose than CBPP1 and CBPP2, including stance-related elements. Total purchases under CBPP2 remained limited (about EUR 16 bn), partly because of increased investor demand for covered bonds and because the concurrent VLTRO operation (see below) discouraged issuance. For more information, see e.g. the [publication of modalities](#) on 3 November 2011 (ECB, 2011a), the [communication of the end of the purchases](#) (ECB, 2012c) and [Smith \(2020a\)](#).
- The three-year lending operation, also known as **Very Long-Term Refinancing Operation** (VLTRO), was announced on 8 December 2011. It formed part of a broader package that included expanded collateral eligibility (notably

additional asset-backed securities and credit claims) and a reduction in the minimum reserve requirements. The objective was to enhance credit support and improve liquidity conditions in money markets. Two operations were conducted at FRFA, with the rate set equal to the average MRO rate over the life of the operation. Banks were allowed to repay early after one year. The interpretation of the MRO rate as a backstop rate is ambiguous. Money market rates were already well below the MRO rate due to abundant excess liquidity, implying that the DFR had become the de facto main policy rate. At the same time, the long maturity and FRFA design could justify a spread over (overnight) money market rates. Overall, we conclude that the VLTRO rate did not constitute a backstop rate. For more information, see the [announcement on 8 December 2011](#) (ECB, 2011b).

- **Outright Monetary Transactions** (OMT) was announced on 2 August 2012. It was designed to safeguard monetary transmission and the singleness of monetary policy in the euro area. Under OMT, the Eurosystem could purchase sovereign bonds of distressed countries, focusing on the short end of the yield curve and subject to strict conditionality – most importantly, a commitment to a European Stability Mechanism (ESM) programme. The central objective was to counter redenomination risk (i.e. speculation against countries to enforce a break-up of the euro). For more information, see the [announcement on 2 August 2012](#) (ECB, 2012a) and the [publication of technical features](#) on 6 September 2012 (ECB, 2012b).
- The first **Targeted Longer-Term Refinancing Operation** (TLTRO 1), announced on 5 June 2014, was a hybrid instrument as it combined the goals of enhancing monetary transmission and supporting lending to the real economy. The operation comprised several series with

maturities of up to four years, initially priced at the MRO rate plus 10 bps and later only the MRO rate. Rates were deliberately not set at very high backstop levels, consistent with the objective of encouraging substantial uptake. The targeted element consisted of incentives linked to banks' lending performance: exceeding a pre-determined benchmark gave access to favourable funding for a longer period, whereas underperformance triggered a forced earlier repayment. TLTROs belonged to a broader class of "funding for lending" programmes, implemented by several central banks.

For more information, see the [announcement on 5 June 2014](#) (ECB, 2014b), the [publication of further details on 3 July 2014](#) (ECB, 2014c) and [Rostagno et al. \(2019\)](#).

- The **Asset Backed Securities Purchase Programme** (ABSPP) was announced on 4 September 2014 with multiple objectives: improving monetary transmission, facilitating credit provision, generating spillovers to other markets, and easing the monetary policy stance. We therefore classify it as a hybrid instrument. While officially announced on 4 September 2014, the ECB had already signalled on 5 June 2014 (together with the announcement of TLTRO 1) that it was considering ABS purchases. From 2015 onward, the ABSPP became part of the broader Asset Purchase Programme (APP), which was explicitly stance-oriented. For more information, see [the announcement on 4 September 2014](#) in a press conference by ECB president Draghi (ECB, 2014d)), the [publication of further details on 2 October 2014](#) (ECB, 2014e) and [Rostagno et al. \(2019\)](#).
- The third **Covered Bond Purchase Programme** (CBPP3) was also announced on 4 September 2014. It is classified as a hybrid operation together

with the ABSPP and TLTRO 1 operations, sharing the common objectives of enhancing monetary transmission, facilitating credit provision, and easing the monetary stance. This clearly hybrid character distinguishes CBPP3 from CBPP1 and CBPP2, which were primarily stabilisation measures.⁴¹ For more information, see [the announcement on 4 September 2014](#) in a press conference by ECB president Draghi (ECB, 2014d)), the [communication of operational details on 2 October 2014](#) (2014e) and [Rostagno et al. \(2019\)](#).

- The second **Targeted Longer-Term Refinancing Operation** (TLTRO 2) was announced on 10 March 2016. Like its predecessor TLTRO 1, it combined monetary transmission and credit support objectives, justifying its classification as a hybrid instrument. The design was different, however: banks that exceeded lending benchmarks were rewarded by a more favourable rate (as low as the DFR, instead of the MRO rate), rather than by maturity extension. For more information, see the [announcement on 10 March 2016](#) (ECB, 2016) and [Rostagno et al. \(2019\)](#).
- In turn, the third **Targeted Longer-Term Refinancing Operation** (TLTRO 3) was announced on 7 March 2019 as a follow-up of TLTRO 2. We have again classified it as a hybrid instrument. The motivation no longer explicitly mentioned monetary transmission but only referred to "*preserving favourable lending conditions and support the accommodative stance*" so the emphasis in the communication shifted more towards stance. At the same time, the conditions – at least initially – became less favourable than those under TLTRO 2: the operations were offered with 2-year maturities (under TLTRO 2, this was up to four years) with

⁴¹ This difference between CBPP3 and the previous covered bond programmes was acknowledged in the ECB's press conference on 4 September 2014, where ECB president Draghi indicated that " ... the purposes of this programme are very different from the previous programmes" (ECB, 2014d).

a backstop rate (rather than close-to-market rates under TLTRO 2).⁴² But later this was relaxed to DFR and MRO rate without any add-on, and the maturity was extended to 3 years with a possibility of early repayment after two years. In the COVID period, TLTRO operations were further extended while conditions were made more attractive (see next item). For more information, see the [announcement on 7 March 2019](#) (ECB, 2019a), the publication of [further technical details on 6 June 2019](#) (ECB, 2019b) and the [changes in modalities on 12 September 2019](#) (ECB, 2019c).

During the COVID crisis and its aftermath, the Eurosystem extended several operations that were already implemented, and launched new instruments:

- The **TLTRO 3 extension** was announced on 12 March 2020 as a direct response to the COVID crisis, to “*support the continued access of firms and households to bank credit in the face of disruptions and temporary funding shortages associated with the coronavirus outbreak*”. Initially (12 March), key parameters of the ongoing TLTRO 3 operation were relaxed by reducing rates by 25 bps, increasing banks’ borrowing allowance and reducing the lending performance benchmark. Later (30 April) rates were further decreased to 50 bps below the DFR and MRO rate, respectively. At the end of that year (10 December), the programme’s horizon was extended significantly, with final repayments occurring only at end-2024, i.e. more than five years after the launch of the programme. We treat the programme’s extension as a separate operation, rather than

part of the original TLTRO 3 operation, reflecting an unanticipated crisis (COVID) that was not foreseen when TLTRO 3 was designed.⁴³ For more information, see the announcements on [12 March](#) and [30 April 2020](#) (ECB, 2020c; ECB, 2020d) and [10 December 2020](#) (ECB, 2020e).

- A **relaxation of USD tender conditions** was announced on 15 March 2020 by the ECB, together with other major central banks. The purpose was to enhance the provision of USD liquidity and restore orderly functioning in EUR/USD swap markets. To make USD liquidity provision more attractive, the pricing was reduced from OIS+50bps to OIS+25bps. In addition, operations were offered at a daily (instead of weekly) frequency, and longer-term (84 days) were offered alongside the regular 7-day operations. For more information, see the [announcement on 15 March 2020](#) (ECB, 2020j) and [Persi \(2020\)](#).
- The **Pandemic Emergency Purchase Programme** (PEPP), announced on 18 March 2020, was initially introduced as a stabilisation programme to safeguard monetary transmission and counter fragmentation. This was done by allowing flexibility in the pace of purchases across jurisdictions and asset classes, so the purchases could address market dysfunction in specific segments. But soon, official communication made clear that the objective was broadened to easing the monetary stance; at the [ECB press conference on 30 April 2020](#) (ECB, 2020f), ECB president Lagarde explicitly said that “... *we have been conducting purchases under (...) PEPP (...), to ease the overall monetary policy stance and to counter the severe risks to the monetary policy transmission mechanism (...)*”, highlighting both

⁴² More specifically: under TLTRO 3 banks would pay DFR plus 10 bps if they would meet the lending benchmark, while under TLTRO 2 this was simply the DFR (i.e. the main policy rate, close to the overnight unsecured money market rate).

⁴³ As the extended TLTRO 3 operations were implemented only on 24 June 2020 – i.e. more than two months after their announcement – the Eurosystem conducted a series of longer-term refinancing operations that were offered every week and all matured June 24. These LTROs served as bridge loans; we do not include them as a separate stabilization tool as we consider them as part of the TLTRO 3 extension. See the [announcement](#) of these LTROs on 12 March 2020 (ECB, 2020i).

the stance and the stabilisation goals of PEPP. For more information, see the [announcement on 18 March 2020](#) (ECB, 2020g) and [Runkel \(2022\)](#).

- The **Commercial Paper** (CP) programme, also announced on 18 March 2020, was launched as an immediate response to acute stress in unsecured short-term funding markets. While technically implemented as an extension of the existing Corporate Sector Purchase Programme (CSPP), we treat this as a distinct operation with a clear stabilisation objective.⁴⁴ See for more information see the [announcement on 18 March 2020](#) (ECB, 2020g) the ECB Blog by [De Guindos and Schnabel \(2020\)](#).
- **Pandemic Emergency Longer-Term Refinancing Operations** (PELTROs) were offered as a backstop to preserve a smooth functioning of money markets. The programme was announced on 30 April 2020. PELTROs were offered every month at backstop rates (MRO rate minus 25 bps, i.e. 25 bps above the DFR which was the main policy rate) and FRFA. PELTROs provided a potential source of longer-term liquidity to banks to fund lending not covered by TLTRO 3. See for more information the [announcement on 30 April 2020](#) (ECB, 2020h) and the [ECB Blog by Lane \(2020\)](#).
- The **Transmission Protection Instrument** (TPI), announced on 21 July 2022, was introduced to safeguard effective monetary transmission. The announcement of TPI must be seen in the context of monetary policy normalisation in 2022, by phasing out large-scale purchase programmes and increasing policy rates. It was introduced as a preventative instrument, to be activated if warranted, focusing primarily on public sector securities (with the potential inclusion of private sector assets). Activation is subject to several eligibility criteria, including

compliance with the EU fiscal framework and a positive debt sustainability assessment. TPI has not yet been activated and still exists alongside OMT (see above), which targets redenomination risk and involves stricter conditionality, notably the requirement of an ESM programme. See for more information the [announcement on 21 June 2022](#) (ECB, 2022).

A.2 Overview of LPLR operations by the Federal Reserve

Table A3 presents an overview of LPLR instruments implemented by the Fed, classified according to the taxonomy presented in Box 2.

The discount window and emergency lending are both classified as permanent tools:

- As a standing facility, the **discount window** is permanently available to depository institutions and provides liquidity against backstop rates. It consists of two main components: primary credit (available to financially sound institutions) and secondary credit (available to institutions that do not qualify for primary credit, and under stricter conditions). While primary credit is mainly intended for BAU liquidity provision, secondary credit can be more akin to emergency lending. For more information see [Arseneau et al. \(2025\)](#).
- Section 13(3) of the Federal Reserve Act empowers the Fed to provide **emergency lending** in “unusual and exigent circumstances”. As such, it is not a specific facility, but rather a legal provision that enables a wide range of interventions. Unlike the discount window, this liquidity may also be extended to NBFIs. Section 13(3) was introduced in the 1930s but remained

⁴⁴ The CSPP had been introduced in 2016 primarily for monetary policy stance reasons (as part of the overall APP), and purchases were restricted to debt securities with a remaining maturity of at least six months. Under the Commercial Paper programme, the eligibility of non-financial commercial paper was extended to securities with a remaining maturity of at least 28 days.

unused for decades, until its reactivation during the GFC. Since then, bilateral liquidity support under Section 13(3) has been used frequently to provide liquidity both bilaterally and through broader programmes. The Dodd Frank Act (2010) significantly tightened the framework: the Fed may no longer lend to individual institutions but only through broadly-based facilities, and any use of Section 13(3) now requires approval by the US Treasury. See for more information [Congressional Research Service \(2020\)](#).

To prepare for potential market stress surrounding the millennium change (Y2K), the Fed created two precautionary facilities:

- The **Standby Financing Facility (SFF)**, announced on 20 July 1999, auctioned options for overnight repurchase agreements on dates around the turn of the year. The facility targeted primary dealers and aimed to support market making and liquidity provision. Options could be exercised at a strike rate of 150 bps above the target federal funds rate, which clearly identifies the SFF as a backstop instrument. Although options with a total notional value of USD 481 bn were sold, none were exercised, which is why reported take-up is zero.
- The **Special Liquidity Facility (SLF)**, also announced on 20 July 1999, provided loans to banks at a backstop rate (150 bps above the federal funds target), with long maturities (extending up to 7 April 2000). The facility's maximum take-up was USD 1.2 bn on 30 December 1999.

For more information on both facilities, see the overview of all open market operations in 1999 in [Federal Reserve Bank of New York \(2000\)](#).

As a response to the 9/11 attacks on the Twin Towers in 2001, the Fed activated two instruments, both announced 12 September 2001:

- Extended **open market operations** were carried out by offering overnight repos (through an auction) at rates close to prevailing market rates. Outstanding volumes peaked at USD 81 bn. These operations complemented the substantial increase in banks' use of the discount window. For more information see [McAndrews and Potter \(2002\)](#).
- The Fed also provided USD liquidity through **bilateral swap lines** with other major central banks; see also the Eurosystem's swap operation in the previous section. See for more information [French \(2023a\)](#).

During the GFC, the Fed implemented a broad range of measures to mitigate systemic risk and stabilise markets. These interventions included emergency liquidity provision to individual institutions as well as broader programmes under Section 13(3) of the Federal Reserve Act. The following facilities were implemented:

- The **Term Auction Facility (TAF)**, announced on 12 December 2007, provided one-month (later extended to three-month) loans to depository institutions through an auction mechanism. The facility was introduced against the backdrop of liquidity shortages in the system and banks' reluctance to access the discount window.⁴⁵ By allocating funds through competitive auctions, the TAF was viewed as a more market-consistent instrument and therefore less prone to stigma than the discount window. See [Runkel and Chen \(2022\)](#) for more information.

⁴⁵ Since August 10, 2007, when money market stress started, the Fed had tried to make the discount window more attractive and counter stigma, by reducing the primary credit rate, increasing loan maturities, and by moral suasion, without much success (Bernanke, 2015).

- In parallel, the Fed also announced **USD swap lines** with other central banks on 12 December 2007, allowing them to provide US dollar liquidity to banks in their respective jurisdictions. These swap lines, together with the associated foreign-central-bank lending operations, can be interpreted as an extension of the domestic TAF framework, sharing similar design features. See [Fleming and Klagge \(2010\)](#) and [French \(2023b\)](#) for more information.
- The **Term Securities Lending Facility** (TSLF), announced on 11 March 2008, was a securities lending programme established under Section 13(3), to support market liquidity. Through the TSLF, the Federal Reserve lent US Treasury securities from its portfolio to primary dealers against less liquid assets as collateral. See [Board of Governors of the Federal Reserve System \(2010\)](#) and [Hoyos \(2020\)](#) for more information.
- The **Primary Dealer Credit Facility** (PDCF), announced on 16 March 2008, provided overnight liquidity to primary dealers, in order to support their market-making function and, by extension, overall market functioning. The PDCF was created under Section 13(3) and offered liquidity at a backstop rate (the discount window's primary credit rate). As it directly targeted a specific group of non-bank counterparties, the PDCF is classified here as a targeted lending operation. See [Adrian et al. \(2009\)](#), [Yang \(2020\)](#) and [Martin and McLaughlin \(2022\)](#) for more information.
- Around the peak of the crisis, three additional facilities were introduced as complementary tools to support short-term funding markets:
 - The **Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility** (AMLF), announced on 19 September 2008, was introduced under Section 13(3) to support money market mutual funds (MMMFs) holding asset-backed commercial paper (ABCP) to ease liquidity pressures in ABCP markets. Under the facility, the Fed extended loans to depository institutions against ABCP collateral, with maturities matching the remaining maturity of the paper. The AMLF represents an early example of a targeted lending program, implemented via regular counterparties which then intermediated the liquidity to a specific sector (MMMFs) and market (ABCP).⁴⁶ It was also a non-recourse facility, i.e. the Fed had no recourse to borrowing counterparties themselves but only to the ABCP collateral; as no haircuts were applied, the Fed took the full downside risk. See [Duygan-Bump et al. \(2010\)](#) and [Wiggins \(2020b\)](#) for more information.
 - The **Commercial Paper Funding Facility** (CPFF), announced on 7 October 2008, was a purchase programme under Section 13(3). It was designed to provide a backstop to the commercial paper market, to improve the functioning of short-term financing markets. Purchases were conducted by a Fed-funded SPV, and were limited to newly issued three-month commercial paper on the primary market from highly rated issuers. Pricing was set at a backstop rate level, defined as the three-month overnight index swap (OIS) rate plus a fixed spread. See [Adrian et al. \(2011\)](#) and [Wiggins \(2020a\)](#) for more information.

⁴⁶ The Fed also developed a facility to lend directly to MMMFs: the Direct Money Market Mutual Fund Lending Facility (DMLF). This facility was never operationalized, however, as MMMFs indicated that they were reluctant to use it. See [Carlson et al. \(2015\)](#).

- The **Money Market Investor Funding Facility** (MMIFF), announced on 21 October 2008, was established under Section 13(3) to provide funding to privately sponsored SPVs, which would then purchase money market instruments from eligible investors. The facility is classified here as a lending operation, as the Fed provided loans to privately-owned vehicles, in contrast to the CPFF (see above) where the purchasing SPV was owned by the Fed. While the facility was made operational, it was never used so overall take-up remained zero. See [Wiggins \(2020c\)](#) for more information.

- The **Agency Mortgage-Backed Securities Purchase Program** (MBS), announced on 25 November 2008, is classified here as a hybrid instrument. It was motivated both by concerns about market dysfunction and by the desire to ease financial conditions more broadly (i.e. stance). As stated in the announcement, the programme aimed “... to reduce the cost and increase the availability of credit for the purchase of houses, which in turn should support housing markets and foster improved conditions in financial markets more generally” (announcement of the MBS program on November 25, 2008). See for more information [Federal Reserve Bank of New York \(2010\)](#) or [Na et al. \(2024\)](#).

- The **Term Asset-Backed Securities Loan Facility** (TALF), announced on 25 November 2008, was introduced to address funding liquidity problems in securitisation markets. The TALF provided term loans with maturities of three and five years, priced at backstop rates defined as fixed spreads over market-based reference indices). The TALF operated as a standing facility with monthly subscription dates and was open to a broad range of US counterparties holding eligible collateral.

Although it was a non-recourse facility, the risk for the Fed was limited by strict collateral quality requirements with collateral haircuts and by first-loss protection provided by the US Treasury. See [Ashcraft et al. \(2012\)](#) for more information.

As a response to the emerging European sovereign debt crisis, the Fed **reestablished USD swaplines** with the ECB and other major central banks. This was announced on 9 May 2010, only a few months after similar swaplines that were launched in the GFC had expired. Central banks that participated in the swaplines used them to offer USD liquidity to their own banking system against a OIS+100bps backstop rate (in November 2011, this was reduced to OIS+50bps, leading to a sharp increase in banks' take-up). For more information, see [French \(2023c\)](#).

During the COVID crisis, the Federal Reserve activated a broad package of measures, including several tools that were re-activated or closely modelled on facilities implemented during the GFC:

- The **Agency Mortgage-Backed Securities Purchase Program** (MBS 2) and **Treasury Securities purchases** were announced on 15 March 2020 with an explicit LPLR motivation: “The FOMC instructed the Desk to conduct these purchases at a pace appropriate to support the smooth functioning of markets for Treasury securities and agency MBS.” We nonetheless classify these measures as hybrid tools, as the Fed’s stated rationale soon shifted from restoring market functioning to easing overall financial conditions.⁴⁷ For more information, see [Fed announcement \(Federal Reserve Bank of New York, 2020\)](#), [Fleming et al. \(2021\)](#), [Na et al. \(2024\)](#).

⁴⁷ On 29 April 2020, six weeks after the activation of this programme, Fed Chairman Powell indicated in a press conference statement: “While the primary purpose of these securities purchases is to preserve smooth market functioning and effective policy transmission, the purchases will offer—will also foster more accommodative financial conditions”. This dual goal was repeated in subsequent Fed communications.

- **USD swap lines with other central banks** were relaxed to increase the provision of dollar liquidity in the market, which was announced on 15 March 2020. The USD swap lines and related lending operations were already operational since the GFC, but access was enhanced by increasing the frequency of operations and reducing the rate from OIS+50 bps to OIS+25bps. While pricing remained above market rates – preserving the backstop character – the adjustment lowered the cost and facilitated the use of dollar liquidity operations by foreign banks, thereby improving global market functioning. See [Hoffner \(2023\)](#) for more information.
- The **Commercial Paper Funding Facility** (CPFF II), announced on 7 March 2020 under Section 13(3), closely resembled the CPFF launched in 2008. Under the facility, the Fed purchased newly issued commercial paper through an SPV at backstop rates (OIS plus a surcharge), with the explicit aim of sustaining a smooth functioning of this market. See [Engbith \(2022a\)](#) for more information.
- The **Primary Dealer Credit Facility** (PDCF II), announced on 17 March 2020 under Section 13(3), provided liquidity to primary dealers at a backstop rate (the discount window's primary credit rate), similar to the PDCF launched in 2008. One notable difference with the previous operation, however, was that in 2008 only overnight liquidity was provided, while in 2020 this was extended to term loans (up to 90 days). The latter made the PDCF compliant with the Liquidity Coverage Ratio (LCR), supporting banks' ability to meet regulatory requirements. See for more information the article by [Martin and McLaughlin \(2022\)](#), which discusses and compares the PDCF and PDCF II facilities.
- The **Money Market Mutual Fund Liquidity Facility** (MMLF), announced on 18 March 2020, was modelled on the AMLF from 2008. Its objective was to help money market funds meet redemption pressures and stabilise short-term funding markets. Under Section 13(3), the Fed extended non-recourse loans to banks against collateral purchased from money market funds, priced at a backstop rate (equal to the primary credit rate). See [Anadu et al. \(2022\)](#) for more information.
- The **Main Street Lending Program** (MSLP), announced on 18 March 2020 under Section 13(3), comprised five facilities to support lending to small and medium-sized enterprises. Loans were originated by private lenders and partially purchased by an SPV, with originators retaining a minority stake, against backstop rates. While the operation had features of a purchase programme (as the SPV would buy majority stakes in a loan), we classified it as a targeted lending operation as it channelled liquidity to firms through the banking system at backstop pricing (LIBOR plus spread). See for more information [English and Liang \(2020\)](#) and [Kelly \(2022a\)](#).
- The **Primary and Secondary Market Corporate Credit Facilities** (PMCCF and SMCCF), announced on 23 March 2020 under Section 13(3), supported corporate bond markets. Both facilities worked through purchases conducted by an SPV. The two facilities were complementary: the SMCCF purchased outstanding securities at market prices, while the PMCCF provided a primary-market backstop at market prices plus a spread and an upfront 100 bps fee. Although actual purchases occurred only under the SMCCF, the PMCCF was important as a backstop by mitigating rollover risk. See also [Leonard \(2022\)](#).

- The **Term Asset-Backed Securities Loan Facility** (TALF II), announced on 23 March 2020 under Section 13(3), revived the GFC-era TALF to support the issuance of asset-backed securities. See [Engbith \(2022b\)](#) for more information.
- The **Paycheck Protection Program Liquidity Facility** (PPPLF), announced on 9 April 2020, was established under Section 13(3) to support the federal government's Paycheck Protection Program (PPP). The facility extended non-recourse loans against government-guaranteed PPP loans to a broad range of lenders, including non-bank institutions. The interest rate was 35bps, which can be interpreted as a backstop rate as it was slightly above the primary credit rate at the time, also given the fully guaranteed collateral. We classify the PPPLF as a hybrid facility, reflecting both its liquidity-support function and its explicit aim of stimulating lending to small firms. For more information, see e.g. [Volker \(2021\)](#).
- The **Municipal Liquidity Facility** (MLF), announced on 9 April 2020, was created under Section 13(3) to support state and local governments to manage their cashflows, which

would help to improve market conditions more generally. Through an SPV, the Fed purchased newly issued debt securities up to three-year maturities at backstop rates. While we classify the facility as a purchase programme, from an economics perspective it also has lending-type characteristics as funding was directly provided to issuers through primary-market purchases rather than via intermediaries. For more information, see e.g. [Kelly \(2022b\)](#).

Finally, in the wake of the US banking turmoil in March 2023, the Fed launched the **Bank Term Funding Program** (BTFP) under Section 13(3), announced on 12 March 2023. The BTFP was a lending operation available to deposit institutions, offering funding at OIS + 10bps against collateral valued at par. While pricing remained above market benchmarks, the terms can be considered relatively generous for a backstop facility and were designed to address acute liquidity pressures associated with unrealised losses on securities portfolios.⁴⁸ See [Nelson et al. \(2025\)](#) for a further discussion.

⁴⁸ At some point, OIS+10bps fell below the Fed's remuneration of reserves (IORB), which triggered extra take-up until the Fed added a the IORB as a floor to the lending rate.

Table A2 LPLR operations Eurosystem

Name of the operation	Period	Announcement	Peak use (EUR)	LPLR or hybrid	Rate	Classification
Marginal Lending Facility (MLF)	Permanent facilities	permanent		LPLR	Backstop	Market-wide lending
Emergency Lending Assistance (ELA)		permanent		LPLR	Backstop	Emergency lending
Temporary narrowing policy rates corridor	Launch of the euro	22 Dec 1998	na	LPLR	na	Other
Temporary increase in MRO maturity around Y2K	Y2K preparation	23 Sept 1999	na	LPLR	na	Other
Fine tuning operation on 12 September 2001	Response to 9/11	12 Sept 2001	69.3 bn	LPLR	Market-consistent (MRO, fixed rate tender)	Market-wide lending
USD swap operation with the Fed		12 Sept 2001	(USD) 19.4 bn	LPLR	na	Other
Fine tuning operation on 9 August 2007	Global Financial Crisis	9 Aug 2007	95 bn	LPLR	Market-consistent	Market-wide lending
USD tenders		12 Dec 2007	(USD) 293 bn	LPLR	Backstop	Market-wide lending
Six-month Long-Term Refinancing Operation (6M LTRO)		28 Mar 2008	50 bn	LPLR	Market-consistent (MRO, variable rate tender)	Market-wide lending
Fixed Rate Full Allotment (FRFA)		8 Oct 2008	na	LPLR	Market-consistent, later backstop	Market-wide lending
One-year Long-Term Refinancing Operation (1Y LTRO)		7 May 2009	668 bn	LPLR	Market-consistent	Market-wide lending
Covered Bond Purchase Programme (CBPP 1)		7 May 2009	60 bn	LPLR	na	Outright purchase
Reactivation of USD liquidity provision	European Debt Crisis & aftermath	10 May 2010	(USD) 90 bn	LPLR	Backstop	Market-wide lending
Securities Markets Programme (SMP)		10 May 2010	221 bn	LPLR	na	Outright purchase
Covered Bond Purchase Programme 2 (CBPP2)		6 Oct 2011	16.4 bn	LPLR	na	Outright purchase
Three-year LTRO or "Very Long-Term Refinancing Operation" (VLTRO)		8 Dec 2011	1018 bn	LPLR	market-consistent (MRO rate)	Market-wide lending
Outright Monetary Transactions (OMT)		2 Aug 2012	0	LPLR	na	Outright purchase
Targeted Longer-Term Refinancing Operation (TLTRO 1)		5 Jun 2014	418 bn	Hybrid	Backstop	Targeted lending
Asset-Backed Securities Purchase Programme (ABSPP)		4 Sept 2014	31.2 bn	Hybrid	na	Outright purchase
Covered Bond Purchase Programme 3 (CBPP3)		4 Sept 2014	303.3 bn	Hybrid	na	Outright purchase
Targeted Longer-Term Refinancing Operation 2 (TLTRO 2)		10 Mar 2016	750 bn	Hybrid	Backstop	Targeted lending
Targeted Longer-Term Refinancing Operation 3 (TLTRO 3)		7 Mar 2019	na	Hybrid	Backstop	Targeted lending
TLTRO 3 extension	COVID & aftermath	12 Mar 2020	2214 bn	Hybrid	Below market rates	Targeted lending
Relaxation of USD tenders		15 Mar 2020	(USD) 145 bn	LPLR	Backstop	Market-wide lending
Pandemic Emergency Purchase Programme (PEPP)		18 Mar 2020	1718 bn	Hybrid	na	Outright purchase
Commercial Paper purchases (CP)		18 Mar 2020	35.4 bn	LPLR	na	Outright purchase
Pandemic Emergency Longer-Term Refin. Operation (PELTRO)		30 Apr 2020	25 bn	LPLR	Backstop	Market-wide lending
Transmission Protection Instrument (TPI)		21 Jul 2022	0	LPLR	na	Outright purchase

Table A3 LPLR operations Federal Reserve System

Name of the operation	Period	Announcement	Peak use (EUR)	LPLR or hybrid	Rate	Classification
Discount window	Permanent facilities	permanent	554 bn	LPLR	Backstop (Primary Credit Rate)	Market-wide lending
Emergency lending - Section 13(3) Federal Reserve Act*		permanent		LPLR	Case-specific	Emergency lending
Y2K Standby Financing Facility (SFF)	Y2K preparation	20 Jul 1999	0	LPLR	Backstop, 150 bps above FFR, auction	Other
Y2K Special Liquidity Facility (SLF)		20 Jul 1999	1.2 bn	LPLR	Backstop, 150 bps above Federal Funds Rate	Market-wide lending
Response to 9/11: open market operations	Response to 9/11	12 Sept 2001	81 bn	LPLR	Market-consistent rate, auction	Market-wide lending
Response to 9/11: USD swap with other central banks		12 Sept 2001	19.5 bn	LPLR	Market-consistent rate	Other
Term Auction Facility (TAF)	Global Financial Crisis	12 Dec 2007	493 bn	LPLR	Market-consistent rate, auction	Market-wide lending
USD swaplines to other central banks		12 Dec 2007	580 bn	LPLR	Backstop (various rates)	Other
Term Securities Lending Facility (TSLF)		11 Mar 2008	235 bn	LPLR	Market-consistent rate, auction	Other
Primary Dealer Credit Facility (PDCF)		16 Mar 2008	140 bn	LPLR	Backstop (Primary Credit Rate)	Targeted lending
Asset-Backed Comm. Paper Money Mkt Mutual Fund Liq. Facility (AMLF)		19 Sept 2008	152 bn	LPLR	Backstop (Primary Credit Rate)	Non-recourse lending
Commercial Paper Funding Facility (CPFF)		07 Oct 2008	350 bn	LPLR	Backstop (Primary Credit Rate)	Outright purchase
Money Market Investor Funding Facility (MMIFF)		21 Oct 2008	0 bn	LPLR	Backstop (Primary Credit Rate)	Targeted lending
Agency mortgage-backed securities purchase program (MBS)		25 Nov 2008	1215 bn	Hybrid	na	Outright purchase
Term Asset-Backed Securities Loan Facility (TALF)		25 Nov 2008	50 bn	LPLR	Backstop (market rates plus spread)	Non-recourse lending
USD swaplines to other central banks		09 May 2010	109 bn	LPLR	Backstop (OIS plus mark-up)	Other
Agency mortgage-backed securities purchase program (MBS 2)		15 Mar 2020	1300 bn	Hybrid	na	Outright purchase
US Treasury securities purchase program		15 Mar 2020	3200 bn	Hybrid	na	Outright purchase
USD swaplines to other central banks: enhancement and extension		15 Mar 2020	449 bn	LPLR	Backstop (OIS+25bps)	Other
Commercial Paper Funding Facility (CPFF II)	COVID	17 Mar 2020	4.3 bn	LPLR	na	Outright purchase
Primary Dealer Credit Facility II (PDCF II)		17 Mar 2020	35 bn	LPLR	Backstop (Primary Credit Rate)	Targeted lending
Money Market Mutual Fund Liquidity Facility (MMLF)		18 Mar 2020	58 bn	LPLR	Backstop (Primary Credit Rate)	Non-recourse lending
Main Street Lending Program (MSLP)		09 Apr 2020	16.6 bn	LPLR	Backstop	Targeted lending
Primary Market Corporate Credit Facility (PMCCF)		23 Mar 2020	0 bn	LPLR	na	Outright purchase
Secondary Market Corporate Credit Facility (SMCCF)		23 Mar 2020	14.1 bn	LPLR	na	Outright purchase
Term Asset-Backed Securities Loan Facility II (TALF II)		23 Mar 2020	3.7 bn	LPLR	Backstop, fee	Non-recourse lending
Paycheck Protection Program Liquidity Facility (PPPLF)		09 Apr 2020	90.6 bn	Hybrid	Backstop	Non-recourse lending
Municipal Liquidity Facility (MLF)		09 Apr 2020	6.4 bn	LPLR	Backstop (OIS plus spread)	Outright purchase
Bank Term Funding Program (BTFP)		Banking turmoil 2023	165 bn	LPLR	Backstop (OIS plus spread)	Market-wide lending

* Firms that received emergency loans under Section 13(3) include AIG, Bear Stearns, Citigroup and Bank of America. Freddie Mac and Fannie May received support under the similar - but more restrictive - Section 13(13) of the Federal Reserve Act. In addition to bilateral liquidity assistance, Section 13(3) has also been invoked to implement most of the market-wide facilities since the GFS, particularly when these involved liquidity provision to non-bank institutions. These facilities under Section 13(3) include TSLF, PDCF, AMLF, CPFF, MMIFF, TALF, CPFF II, MMLF, MSLP, PMCCF, SMCCF, TALF II, PPPLF, MLF and BTFP.

References

- Adrian, T., C.R. Burke and J.J. McAndrews (2009), The Federal Reserve's Primary Dealer Credit Facility, *Current Issues in Economics and Finance*, 15(4)
- Adrian, T., K. Kimbrough and D. Marchioni (2011), The Federal Reserve's Commercial Paper Funding Facility, *FRBNY Economic Policy Review*, May 2011, pp. 25-39
- Anadu, K., M. Cipriani, R. Craver and G. La Spada (2022), The Money Market Mutual Fund Liquidity Facility, *FRBNY Economic Policy Review*, 28(1), pp. 139-160
- Armentier, O., M. Cipriano and A. Sarkar (2024), Discount window stigma after the Global Financial Crisis, Staff Report no. 1137, Federal Reserve Bank of New York
- Arseneau, D., M. Carlson, K. Chen, M. Darst, D. Kirkeeng, E. Klee, M. Malloy, B. Malin, E. O'Malley, F. Niepmann, M-F. Styczynski, M. Vanouse and A.P. Vardoulakis (2025), Central bank liquidity facilities around the world, *FEDS Notes*, Board of Governors of the Federal Reserve System
- Ashcraft, A., A. Malz and Z. Pozsar (2012), The Federal Reserve's Term Asset-Backed Securities Loan Facility, *FRBNY Economic Policy Review*, November 2012, pp. 29-66
- Bagehot, W. (1873), *Lombard Street: A description of the money market*, Henry S. King & Co
- Bank of England (2024), Transitioning to a repo-led operating framework, Discussion paper
- Bats, J., J.W. van den End and J. Thoolen (2018), Revisiting the central bank's lender of last resort function, *DNB Occasional Studies*, No. 16-4
- Benes, J., and M. Kumhof (2012), The Chicago Plan Revisited. IMF Working Paper, WP/12/202
- Bernanke, B. (2008), Liquidity Provision by the Federal Reserve. Speech, at the Federal Reserve Bank of Atlanta Financial Markets Conference
- Bernanke, B. (2015), The courage to act, W.W. Norton & Company
- Bindseil, U. (2014), Monetary policy operations and the financial system, Oxford University Press
- Bindseil, U. (2016), Evaluating Monetary Policy Operational Frameworks, paper written for the 40th Economic Policy Symposium of the Federal Reserve Bank of Kansas, Jackson Hole
- Bindseil, U. and E. Lanari (2022), Fire Sales, the LOLR, and Bank Runs with Continuous Asset Liquidity, *Journal of Financial Crises*, 4(4), pp. 77-102
- BIS Committee on the Global Financial System (2017), Designing frameworks for central bank liquidity assistance: addressing new challenges, *CGFS Papers*, No. 58
- BIS Markets Committee (2022), Market dysfunction and central bank tools, Basel
- Board of Governors of the Federal Reserve System (2010), Term Securities Lending Facility, website message, 5 February 2010
- Bordes, C. and L. Clerc (2013), The ECB's separation principle: does it "rule OK"? From policy rule to stop-and-go", *Oxford Economic Papers*, 65, pp. 66-91

Bordo, M.D. (1990), The lender of last resort: alternative views and historical experience, *Economic Review*, Federal Reserve Bank of Richmond, January/February, pp. 18-29

Borio, C. (2023), Getting up from the floor, *BIS Working Papers*, No. 1100

Böser, F., A. Martin and S. Stadelmann (2024), A Poole-based perspective on monetary policy implementation, *SNB Economic Note*, No. 5/2024

Brunnermeier, M., and L.H. Pedersen (2009), Market liquidity and funding liquidity, *Review of Financial Studies*, 22(6), pp. 2201-2238

Buiter, W., S. Cecchetti, K. Dominguez and A. Sanchez Serrano (2023), Stabilising financial markets: lending and market making as a last resort, *European Systemic Risk Board, Reports of the Advisory Scientific Committee*, No. 13

Buiter, W., and A. Sibert (2007), The central bank as market maker of last resort, *VoxEU Column*

Carlson, M., B. Duygan-Bump and W. Nelson (2015), Why do we need both liquidity regulations and a lender of last resort? A Perspective from Federal Reserve Lending during the 2007-09 U.S. Financial Crisis, *Finance and Economics Discussion Series*, No. 2015-011, Federal Reserve Board

Cavallino, P., M. Drehmann, R. Finlay and J. Remache (2025), Monetary policy operational frameworks – a new taxonomy, *BIS Quarterly Review*, September 2025, pp. 49-65

Coelho, R., M. Drehmann, D. Murphy and R. Walters (2024), Navigating liquidity stress: operational readiness for central bank support, *FSI Insights on Policy Implementation*, No. 64, Bank for International Settlements

Congressional Research Service (2020), *Federal Reserve: Emergency Lending*, Washington

De Guindos, L., and I. Schnabel (2020), The ECB's commercial paper purchases: A targeted response to the economic disturbances caused by COVID-19, *ECB Blog*, 3 April 2020

Dobler, M., S. Gray, D. Murphy and B. Radzewicz-Bak (2016), The lender of last resort function after the global financial crisis, *IMF Working Paper*, WP/16/10

Domanski, D., R. Moessner and W. Nelson (2014), Central banks as lenders of last resort: experiences during the 2007–10 crisis and lessons for the future, in: *Re-thinking the lender of last resort*, *BIS Papers*, No. 79

Duygan-Bump, B., P.M. Parkinson, E.S. Rosengren, G.A. Suarez and P.S. Willen (2010), How effective were the Federal Reserve emergency liquidity facilities? Evidence from the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, *Federal Reserve Bank of Boston Working Paper No. QAU10-3*

ECB (1998), The ECB interest rates to be applied at the start of Stage Three, press release, 22 December 1998

ECB (1999), Indicative calendar for the Eurosystem's tender operations in the year 2000 including an adjustment to smooth the century date change, press release, 23 September 1999

ECB (2000), *Monthly Bulletin*, January

ECB (2001a), Fine tuning operation on 12 September 2001, press release, 12 September 2001

ECB (2001b), Monthly Bulletin, October

ECB (2001c), Swap agreement with the Federal Reserve, press release, 13 September 2001

ECB (2007a), Monthly Bulletin, September

ECB (2007b), Measures designed to address elevated pressures in short-term funding markets, press release, 12 December 2007

ECB (2008a), The Eurosystem's open market operations during the recent period of financial market volatility, ECB Monthly Bulletin, May, pp. 98-104

ECB (2008b), Supplementary six-month longer-term refinancing operations and continuation of the supplementary three-month longer-term refinancing operations, press release, 28 March 2008

ECB (2008c), Changes in tender procedure and in the standing facilities corridor, press release, 8 October 2008

ECB (2009a), Longer-term refinancing operations, press release, 7 May 2009

ECB (2009b), Introductory statement to the press conference with Q&A, transcript, 7 May 2009

ECB (2009c), Purchase programme for covered bonds, press release, 4 June 2009

ECB (2010a), Reactivation of US dollar liquidity providing operations, press release, 10 May 2010

ECB (2010b), ECB decides on measures to address severe tensions in financial markets, press release, 10 May 2010

ECB (2011a), ECB announces details of its new covered bond purchase programme (CBPP2), press release, 3 November 2011

ECB (2011b), ECB announces measures to support bank lending and money market activity, press release, 8 December 2011

ECB (2012a), Introductory statement to the press conference with Q&A, press conference, transcript, 2 August 2012

ECB (2012b), Technical features of Outright Monetary Transactions, press release, 6 September 2012

ECB (2012c), Ending of covered bond purchase programme 2 (CBPP2), press release, 31 October 2012

ECB (2014a), Decision of the European Central Bank on the implementation of separation between the monetary policy and supervision functions of the European Central Bank, ECB/2014/39, Frankfurt

ECB (2014b), ECB announces monetary policy measures to enhance the functioning of the monetary policy transmission mechanism, press release, 5 June 2014

ECB (2014c), ECB announces further details of the targeted longer-term refinancing operations, 3 July 2014

ECB (2014d), Introductory statement to the press conference with Q&A, transcript, 4 September 2014

ECB (2014e), ECB announces operational details of asset-backed securities and covered bond purchase programmes, press release, 2 October 2014

ECB (2016), ECB announces new series of targeted longer-term refinancing operations (TLTRO II), press release, 10 March 2016

ECB (2019a), Monetary policy decisions, press release, 7 March 2019

ECB (2019b), ECB announces details of new targeted longer-term refinancing operations (TLTRO III), press release, 6 June 2019

ECB (2019c), ECB announces changes to new targeted longer-term refinancing operations (TLTRO III), press release, 12 September 2019

ECB (2020a), ECB Banking Supervision provides temporary capital and operational relief in reaction to coronavirus, press release, 12 March 2020

ECB (2020b), ECB allows temporary relief in banks' leverage ratio after declaring exceptional circumstances due to pandemic, press release, 17 September 2020

ECB (2020c), ECB announces easing of conditions for targeted longer-term refinancing operations (TLTRO III), press release, 12 March 2020

ECB (2020d), ECB recalibrates targeted lending operations to further support real economy, press release, 30 April 2020

ECB (2020e), ECB prolongs support via targeted lending operations for banks that lend to the real economy, press release, 10 December 2020

ECB (2020f), Introductory statement to the press conference with Q&A, press conference, transcript, 30 April 2020

ECB (2020g), ECB announces €750 billion Pandemic Emergency Purchase Programme (PEPP), press release, 18 March 2020

ECB (2020h), ECB announces new pandemic emergency longer-term refinancing operations, press release, 30 April 2020

ECB (2020i), ECB announces measures to support bank liquidity conditions and money market activity, 12 March 2020

ECB (2020j), Coordinated central bank action to enhance the provision of global US dollar liquidity, press release, 15 March 2020

ECB (2022), The Transmission Protection Instrument, press release, 21 July 2022

ECB (2024), Agreement on emergency liquidity assistance, Frankfurt

Engbith, L.S. (2022a), United States: Commercial Paper Funding Facility II, *Journal of Financial Crises*, 4(2), pp. 1824-1844

Engbith, L.S. (2022b), United States: Term Asset-Backed Securities Loan Facility II, *Journal of Financial Crises*, 4(2), pp. 1880-1903

English, W.B., and J.N Liang (2020), Designing the Main Street Lending Program: challenges and options, *Journal of Financial Crises*, 2(3), pp. 1-40

Federal Reserve Bank of New York (2000), Domestic open market operations during 1999, Federal Reserve Bank of New York, Markets Group

Federal Reserve Bank of New York (2010), FAQs: MBS Purchase Program, website, 28 June 2010

Federal Reserve Bank of New York (2020), Statement regarding Treasury securities, Agency Mortgage-Backed Securities, and repurchase agreement operations, press release, 15 March 2020

Fleming, M.J., and N.J. Klagge (2010), The Federal Reserve's foreign exchange swap lines, *Current Issues in Economics and Finance*, 16(4)

Fleming, M.J., and N.J. Klagge (2011), Income Effects of Federal Reserve Liquidity Facilities, *Current Issues in Economics and Finance*, 17(1)

Fleming, M., H. Liu, R. Podjasek and J. Schurmeier (2021), The Federal Reserve's market functioning purchases, Federal Reserve Bank of New York Staff Reports, no. 998

French, J. (2023a), United States: central bank swaps to the Eurozone, UK, and Canada, 2001, *Journal of Financial Crises*, 5(1), pp. 449-461

French, J. (2023b), United States: central bank swaps to 14 countries, 2007-2009, *Journal of Financial Crises*, 5(1), pp. 482-508

French, J. (2023c), United States: Central bank swaps to five countries, 2010-2011, *Journal of Financial Crises*, 5(1), pp. 462-481

Garcia-Pascual, A., T. Piontek, R. Veyrune and J. Wu (2025), Addressing market dysfunction and liquidity stresses in nonbank financial intermediaries, *Global Financial Stability Notes*, NOTE/2025/004, International Monetary Fund.

Goodfriend, M., and R.G. King (1988), Financial deregulation, monetary policy and central banking, *Economic Review*, Federal Reserve Bank of Richmond, 74 (May-June), pp. 3-22

Goodhart, C.A.E. (1999), Myths about the lender of last resort, *International Finance* 2(3), pp. 339-360

Gravelle, T. (2024), Going back to normal: The Bank of Canada's balance sheet after quantitative tightening, speech, CFA Society Toronto

Hansson, D., and I.W. Johansson (2023), The Riksbank's monetary policy operational framework after the 2019-2022 reform, *Sveriges Riksbank Economic Review*, 2, pp. 30-62

Hauser, A., (2022), Thirteen days in October: how central bank balance sheets can support monetary and financial stability, speech

Hoffner, B. (2023) United States: central bank swaps to 14 countries, 2020, *Journal of Financial Crises*, 5(1), pp. 509-531

Houben, A., J. Kakes and A. Petersen (2022), The interaction of monetary and financial tasks in different central bank structures, in: Holzmann, R. and F. Restoy (2022), *Central Banks and Supervisory Architecture in Europe*, Edward Elgar

Houben, A., J. Kakes and G. Schinasi (2004), Toward a framework for safeguarding financial stability, *IMF Working Paper*, WP/04/101

Hoyos, L. (2020), Term Securities Lending Facility (TSLF) (U.S. GFC), *Journal of Financial Crises*, 2(3), pp. 202-228

International Monetary Fund (IMF) (2020), The central bank transparency code – Staff proposal, *IMF Policy Paper*

Kakes, J., I. Klaver and R. Rollingswier (2022), The Eurosystem's monetary toolbox in unconventional times, *DNB Occasional Study*, 20(2)

Kelly, S. (2022a), United States: Main Street Lending Program, *Journal of Financial Crises*, 4(2), pp. 1983-2021

Kelly, S. (2022b), United States: Municipal Liquidity Facility, *Journal of Financial Crises*, 4(2), pp. 1904-1932

Kent, C. (2024), The future system for monetary policy implementation, speech, Bloomberg Australia Briefing

King, M. (2016), *The end of alchemy: money, banking and the future of the global economy*, WW Norton & Company

Knot, K. (2025), On Phronesis and Price Stability, speech delivered at the Euro50 Group's 25th anniversary at Banque de France

Lane, P.R. (2020), The monetary policy response to the pandemic emergency, *ECB Blog*, 1 May 2020

Leonard, N. (2022), United States: Primary Market Corporate Credit Facility and Secondary Market Corporate Credit Facility, *Journal of Financial Crises*, 4(2), pp. 1797-1823

Martin, A. (2009), Reconciling Bagehot and the Fed's Response to September 11, *Journal of Money, Credit and Banking*, 41(2/3), pp. 397-415

Martin, A., and S. McLaughlin (2022), The Primary Dealer Credit Facility, *FRBNY Economic Policy Review*, 28(1), pp. 130-138

McAndrews, J.J., and S.M. Potter (2002), Liquidity effects of the events of September 11, 2001, *FRBNY Economic Policy Review*, November, pp. 59-79

Na, D., E. Newman and B. Schlusche (2024), The Evolution of the Federal Reserve's Agency MBS Holdings, *FEDS Notes*, Board of Governors of the Federal Reserve System

Nelson, B., P. Parkinson, L.S. Plassman and F.G. Rosa (2025), Bank Term Funding Program: Experience and Lessons Learned, Research Paper, Bank Policy Institute

Rostagno, M., C. Altavilla, G. Carboni, W. Lemke, R. Motto, A. Saint Guilhem and J. Yiangou (2019), A tale of two decades: the ECB's monetary policy at 20, *ECB Working Paper*, No. 2346

Perli, R., (2025), The evolution of the Federal Reserve's monetary policy implementation framework, speech, Columbia SIPA Monetary Policy Implementation Workshop, New York

Persi, G. (2020), US dollar funding tensions and central bank swap lines during the COVID-19 crisis, *ECB Economic Bulletin*, Issue 5, pp. 25-31

Pinter, G., E. Siriwardane and D. Walker (2024), Fire sales of safe assets, *BIS Working Papers*, No. 1333

Runkel, C.N. (2022), Eurozone: Pandemic Emergency Purchase Program, *Journal of Financial Crises*, 4(2), pp. 1569-1600

Runkel, C.N., and A. Chen (2022), United States: Term Auction Facility, *Journal of Financial Crises*, 4(2), pp. 1374-1409.

Schnabel, I. (2023), Monetary and financial stability – can they be separated?, Speech at the Conference on Financial Stability and Monetary Policy in the honour of Charles Goodhart

Schnabel, I. (2024), The Eurosystem's operational framework, speech, Money Market Contact Group meeting

Selgin, G.A. (1988), The theory of free banking money supply under competitive note issue, Totowa, NJ: Rowman & Littlefield

Simon, C. (2020), The United Kingdom's Corporate Corporate Bond Secondary Market Scheme, *Journal of Financial Crises*, 2(3), pp. 488-503

Smith, A. (2020a), The European Central Bank's Covered Bond Purchase Programs I and II, *Journal of Financial Crises*, 2(3), pp. 382-404

Smith, A. (2020b), The European Central Bank's Securities Markets Programme, *Journal of Financial Crises*, 2(3), pp. 369-381

Sylla, R., R.E. Wright and D.J. Cowen (2009), Alexander Hamilton, Central Banker: Crisis Management during the U.S. Financial Panic of 1792, *Business History Review*, 83(1), pp. 61-86

Trichet, C. (2008), Some lessons from the financial market correction, Speech, "European Banker of the Year 2007" award ceremony

Tucker, P. (2014), The lender of last resort and modern central banking: principles and reconstruction, in: *Re-thinking the lender of last resort*, BIS Papers, No. 79

Volker, D. (2021), The Paycheck Protection Program Liquidity Facility, Staff Report no. 978, Federal Reserve Bank of New York

Wiggins, R.Z. (2020a), The Commercial Paper Funding Facility (U.S. GFC), *Journal of Financial Crises*, 2(3), pp. 174-201

Wiggins, R.Z. (2020b), The Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) (U.S. GFC), *Journal of Financial Crises*, 2(3), pp. 229-256

Wiggins, R.Z. (2020c), The Money Market Investor Funding Facility (U.S. GFC), *Journal of Financial Crises*, 2(3), pp. 257-280

Yang, K. (2020), The Primary Dealer Credit Facility (PDCF) (U.S. GFC), *Journal of Financial Crises*, 2(3), pp. 152-173

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