STUDY

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Excess liquidity in the euro area: developments and implications

Compilation of papers

Economic Governance and EMU Scrutiny Unit (EGOV)
Directorate-General for Internal Policies
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Monetary Dialogue September 2023

Abstract

As monetary policy continues to tighten and excess liquidity is gradually drained from the banking system, the European Central Bank (ECB) is confronted with a decision on which liquidity provision framework the Eurosystem should adopt going forward. Three papers were prepared by the ECON Committee's Monetary Expert Panel, discussing the relative advantages and disadvantages of the ample reserves/floor system versus the scarce reserves/corridor system.

This document was provided by the Economic Governance and EMU Scrutiny Unit at the request of the Committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 25 September 2023.

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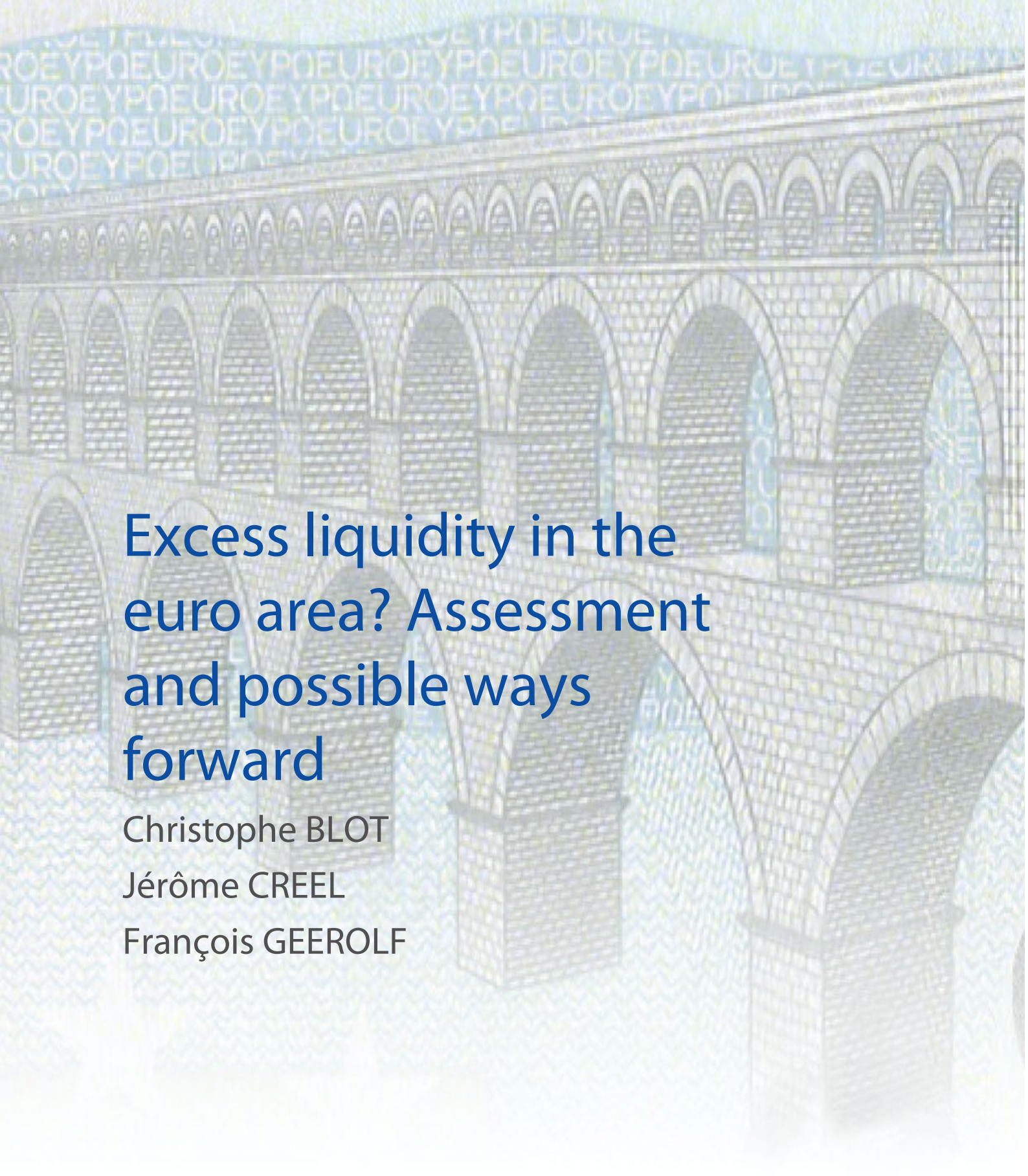

Excess liquidity in the euro area? Assessment and possible ways forward

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Abstract

This paper analyses the operational frameworks adopted by the ECB and the consequences of a shift from the floor to the corridor system. The concept of excess liquidity in the euro area is examined, alongside discussions on market liquidity and funding liquidity. The paper emphasises the need to evaluate the implications for monetary policy effectiveness and financial stability of the different frameworks, shedding light on the role of liquidity in maintaining well-functioning financial markets.

This document was provided by the Economic Governance and EMU Scrutiny Unit at the request of the Committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 25 September 2023.

CONTENTS

LIST OF ABBREVIATIONS

APP	Asset purchase programme
DFR	Deposit facilitiy rate
ECB	European Central Bank
EONIA	Euro Overnight Index Average
€STR	Euro short-term rate
HQLA	High-quality liquid assets
LCR	Liquidity coverage ratio
LTRO	Longer-term refinancing operations
MFIs	Monetary and financial institutions
MRO	Main refinancing operations
NBFI	Non-bank financial intermediaries
NCBs	National central banks
PEPP	Pandemic emergency purchase programme
PELTRO	Pandemic emergency longer-term refinancing operations
TLTRO	Targeted longer-term refinancing operations

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EXECUTIVE SUMMARY

- Following the global financial crisis (GFC), central banks adopted asset purchases and additional liquidity operations to support expansionary monetary policy and enhance financial stability. Meanwhile, **the ECB's operational framework has shifted from a corridor system to a floor system, resulting in the accumulation of excess liquidity by banks**.
- **The paper examines different forms of liquidity (market liquidity, funding liquidity) and explains how their interdependence can impact asset values and overall market stability.** It also delves into the evolving nature of liquidity and the potential misconceptions about liquidity enhancement through asset purchase programs.
- **As the ECB turned its monetary stance into restrictive, excess liquidity has remained relatively high, prompting questions about the most suitable operational framework for the euro area.**
- **Whatever the system – corridor or floor –, the ECB will be able to steer the overnight rate (the short end of the yield curve) and to influence the long end of the yield curve.** Consequently, this choice would not be a crucial issue for monetary policy.
- **However, reverting to a corridor system will translate into a *de facto* tightening of monetary policy as the overnight interest rate would jump from the deposit facility rate (DFR) (the policy target in the floor system) to the main refinancing operations (MRO) rate (the policy target in the corridor system).** It would also entail a reduction of the size of Eurosystem's balance sheet. The implied quantitative tightening would not be neutral for the stance of monetary policy. The ECB would have to deliver clear communication on this policy shift.
- The rise of excess reserves was mainly demand-driven in the context of the GFC and then the sovereign debt crisis. Reverting to the corridor system should be conditional on the ability of the interbank market to channel liquidity among commercial banks. **As the role of interbank market has sharply decreased, there is uncertainty about the risk of reverting to a corridor system.**
- **Commercial banks may desire to hold a higher share of liquid and safe assets.** Central banks are able to provide an additional source of safe assets that would be an alternative to other safe securities such as short-term Treasury bills.
- **In a system of abundant reserves, the ECB would need to either opt for maintaining asset purchases or for providing ample liquidity to commercial banks through liquidity operations.** Asset purchase for financial stability motives may interact with monetary policy decisions. Liquidity operations are demand-driven and thus more easily adjusted to banks' needs of liquid assets.

1. INTRODUCTION

The transmission of monetary policy hinges on the effect of central banks decisions on financing conditions faced by households and non-financial corporations. To that end, central banks usually set a target for the short-term interest and conduct open-market operations to ensure that the effective overnight interest rate remains close to that target. Those operations also matter for financial stability since they enable the central banks to adjust liquidity in the money market. Until the global financial crisis (GFC), the operational framework within which liquidity provisions took place were usually viewed as a technical dimension of central banking that did neither really matter for the understanding of monetary policy nor of its effects.

To deal with the challenges raised by the GFC, central banks have resorted to asset purchases and to additional liquidity operations to reinforce the expansionary stance of monetary policy and to improve financial stability. The European Central Bank (ECB) has changed the framework through which monetary policy is implemented by moving from a corridor system to a floor system, where banks accumulate so-called "excess liquidity", meaning liquidity amounts exceeding those consistent with minimum reserve requirements[1].

The level of liquidity in the financial system matters for financial stability. But liquidity may sometimes be an elusive notion. To that end, we first come back to the definition and measurement of liquidity in the euro area. It is interesting to note that so far, the ECB's shift towards a restrictive stance (policy rates have increased substantially, with the deposit facility rate reaching its highest level ever after a decision on 14 September 2023, see Figure 9 in the Annex) has had only a little impact on excess liquidity.

While the resurgence of inflation has brought the Governing Council to increase interest rates and to engage in a reduction of the size of the Eurosystem's balance sheet, a few questions arise as to what operational framework – corridor or floor system – would be best suited to the euro area economic and financial situation. Does the return to a "normal" situation (with positive interest rates) call for a return to the pre-crisis framework for the implementation of monetary policy? Does it matter for the stance of monetary policy if the ECB maintains the floor system or if it turns back to the corridor system? What would be the consequences for financial stability if excess liquidity is withdrawn as it would be the case under the corridor system?

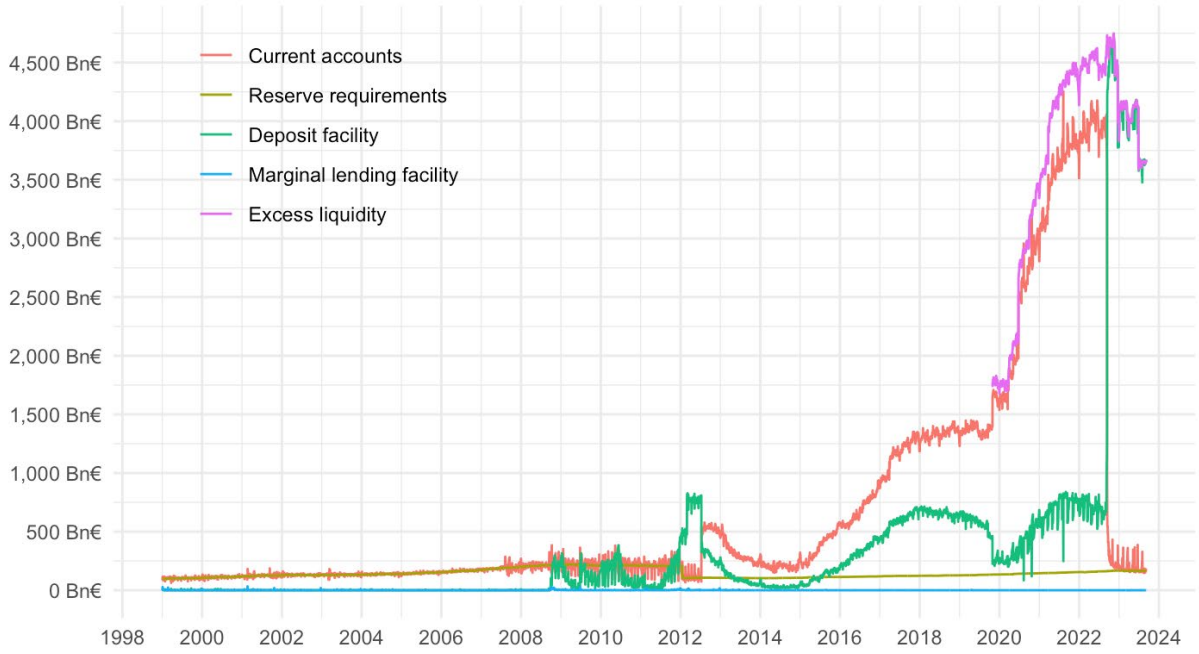
[1] Banks holding minimum reserves are meant to be better equipped in case of deposit withdrawals, therefore reducing uncertainty on the side of depositors of bank liquidity risk and ultimately limiting the risk of bank runs by depositors. While minimum reserve requirements are common monetary policy tools – the ECB sets a rate of 1% of bank deposits -, the US Fed, the Bank of Canada or the Swedish Riskbank do not apply them. In the euro area, minimum reserves have long been remunerated at the main refinancing operations (MRO) rate but in October 2022, after all ECB policy rates returned to positive territories, the ECB decided that minimum reserves would be remunerated at the deposit facility rate (always lower than the MRO). Finally, the ECB announced in July 2023 that it will stop paying interest on required reserves effective on 20 September 2023.

2. SIZING UP EXCESS LIQUIDITY IN THE EURO AREA

In the context of the ECB, excess liquidity corresponds to liquidity in the financial system in excess of banks' liquidity needs, which come from regulatory purposes (reserve requirements) and for managing day-to-day liquidity. It is thus the sum of two parts: banks' reserves above the reserve requirements ("excess reserves"), and the recourse to the deposit facility net of the recourse to the marginal lending facility.

Banks' reserves (also referred to as "current accounts") can be thought of as commercial banks' accounts at the central bank. The first component of excess liquidity therefore consists in excess reserves, or reserves in excess of reserve requirements. As shown on in Figure 1, in the first years of the euro, current accounts consisted mainly of reserve requirements, so that "excess reserves" were close to zero while deposit and marginal lending facility were not used. In other words, there was essentially no excess liquidity. Since the GFC, the deposit facility has started to be used, and has since around mid-2022 shot up to an unprecedented level, now representing the bulk of excess liquidity. Another major development is that excess reserves has also gone up quite a bit also since the GFC but even more importantly since the COVID-19 crisis and the major liquidity-providing operations (more on this below). Since mid-2022 however, excess reserves have essentially disappeared whereas excess liquidity remains at a high level. The recent decline of the latter owes to the gradual repayment of target long term refinancing operations (TLTRO III).

Figure 1: Decomposing excess liquidity: current accounts, reserve requirements, deposit facility, marginal lending facility, in € bn (from 1999)



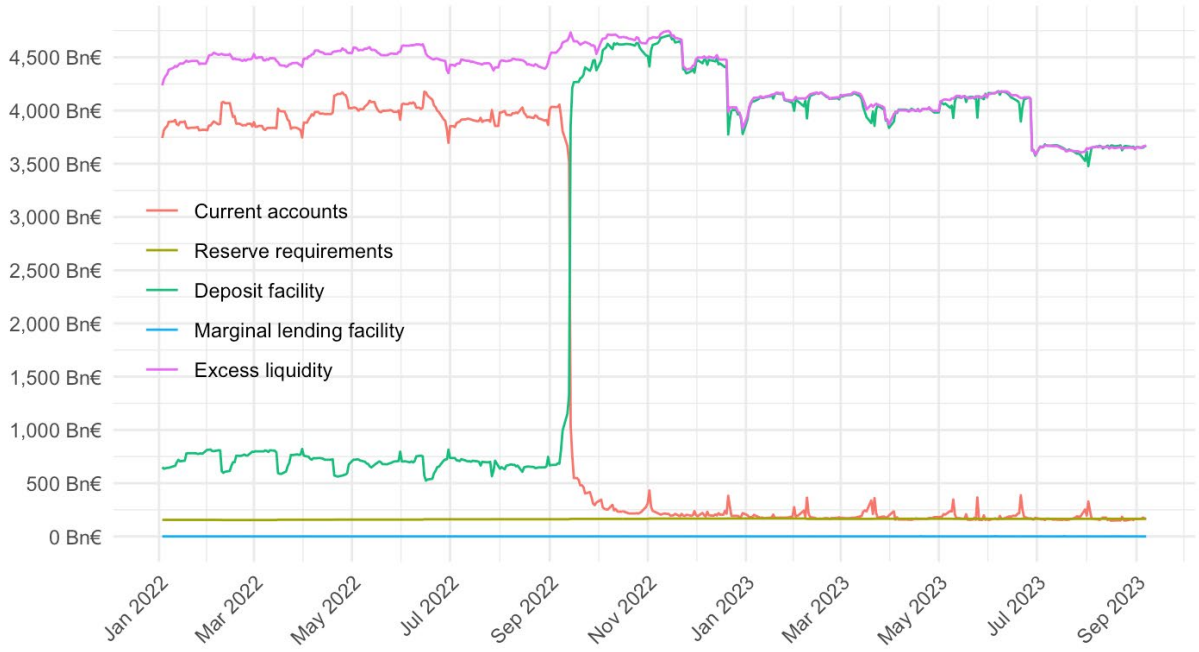
Source: ECB, authors' calculation.

Note: Excess liquidity = (Current accounts)-(Reserve requirements) + (Deposit facility – Marginal lending facility)

Such an important switch from banks' current accounts at the central bank to the deposit facility is in fact not that surprising. As shown on Figure 2, which is simply zooming in on Figure 1 starting in early 2022, it happened on 14 September 2022 when the deposit facility rate (DFR) went from 0% to 0.75%,

and so it became worthwhile to move banks' excess liquidity onto the deposit facility rather than keep it in current accounts at the central bank[2].

Figure 2: Decomposing excess liquidity: current accounts, reserve requirements, deposit facility, marginal lending facility, in € bn (from 2022)



Source: ECB, authors' calculation.

[2] From 2014 until September 2022, current accounts (or excess reserves) were remunerated at the DFR but in September 2022, the ECB announced that the remuneration rate would go back to zero.

3. MARKET AND FUNDING LIQUIDITY

While the ECB has provided liquidity that is now in excess, central banks are not the only supplier of liquidity. Banks are able to provide liquidity to one another, to households, potentially against assets as collateral. However, such liquidity can also quickly evaporate, for example during financial crises such as the GFC of 2007-2009, which is where the central bank can start to play an essential role.

3.1. Some theory: different forms of liquidity

From a theoretical standpoint, there are many ways to define liquidity, although the term is used interchangeably by financial market practitioners and central bank policymakers. In a Diamond & Dybvig (1983) model of bank runs for example, liquidity shocks refer to the need to sell an asset in order to consume early, in which case there is a need to "liquidate" the asset. Financial institutions are then useful in that they provide the type of liquidity which consumers need in order to fulfill those needs, while allowing a long-term financing of the economy (Farhi et al., 2009). Liquidity is therefore foundational to banking and henceforth, to central banking.

Liquidity comes in different flavors. Market liquidity refers to the ease to sell an asset without altering its price, while funding liquidity refers to the ease with which one can borrow against solvent assets. Treasury securities provide both for market and funding liquidity in that the market for Treasury debt is very liquid (Treasuries sell at a very small discount from their face value). This is why Treasury securities are also very good collateral.

Liquidity is important for the smooth functioning of financial markets. When liquidity dries up abruptly, a severe financial crisis can ensue and one function of central banks is then to intervene to restore liquidity in order to restore an orderly flow of funds towards needing borrowers. In fact, historically, this has even been the main function of central banks as the "lender of last resort", even before setting short-term interest rates through the supply of liquidity on money markets (Bagehot, 1873; Monnet 2014): according to Bagehot's dictum, during financial crises central banks should lend freely, at a penalty rate, against good collateral.

As the Silicon Valley Bank (SVB) collapse has helped show, central bank collateral policy can in fact determine what is being considered money (liquidity) and what is not. By being a provider of the ultimate form of liquidity and being able to create an unlimited supply of it, central banks can therefore make any asset potentially liquid. Another example closer to Europe is that of Greek bonds in early 2010: whether Greek bonds would be eligible for refinancing at the ECB was very important for Greek banks in desperate need for liquidity. As this example and that of SVB also show, there is never such a thing as a pure liquidity crisis: the question always is to ask whether assets sell (or refinance) for too low prices because liquidity has evaporated or because assets are poor quality. Moreover, there is also an important problem of moral hazard which the "lender of last resort" creates: if there is an anticipation of bail out, there is a contradiction between rescuing banks ex-post (for example through lower short-term interest rates) and providing good incentives ex-ante (Farhi & Tirole, 2009).

The same questions arise today, as central banks such as the ECB are withdrawing liquidity at an unprecedented pace, which could potentially trigger a liquidity crisis (although these fears have been alleviated for now and banks do not show a higher appetite for MROs, now at around EUR 7 billion, against EUR 100-300 billion before 2015 as shown on Figure 10[3]). But not withdrawing support now could also sow the seeds of future risk-taking by banks, encouraging them to be too illiquid.

[3] See the data at https://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=123.ILM.W.U2.C.A050100.U2.EUR.

3.2. Interplay between funding and market liquidity

To make matters worse, there is also an interplay between market and funding liquidity: indeed, assets used as collateral can see their values drop when market liquidity evaporates. Funding liquidity then also lowers, as the value of collateral drops, and this further leads to a decrease in market liquidity.

We can take an example for the housing market: as lending in the housing market becomes scarcer, it becomes more and more difficult to sell a house without a loss in value (market liquidity). At the same time, this implies that banks may be more reluctant to lend using housing as collateral, because the price of housing might drop even further in value. As a consequence, deteriorating market liquidity leads to deteriorating funding liquidity for housing. In turn, when it becomes harder to lend against housing collateral, new homeowners are more credit constrained and can bid up the price of housing less, which leads to a further drop in housing values (Geerolf, 2018). These mechanisms were very much operating during the global financial crisis (Brunnermeier, 2009). Market and funding liquidity are shown to feedback on each other through a self-reinforcing "liquidity spiral" (Brunnermeier & Pedersen, 2009).

3.3. How is liquidity evolving?

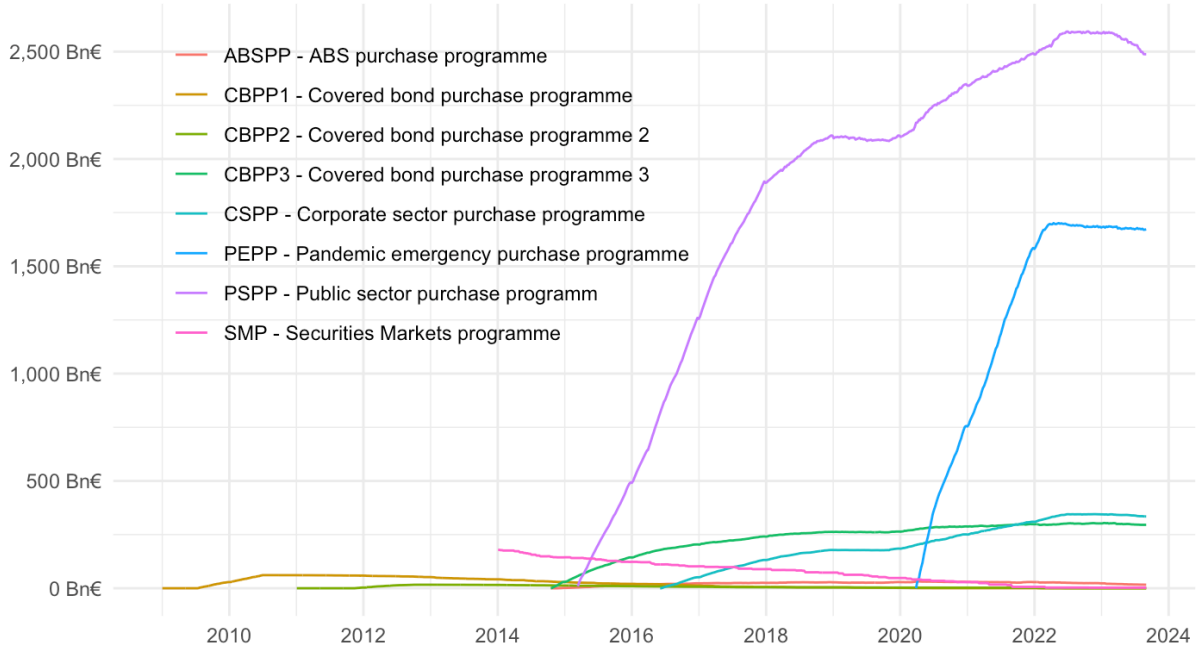
Of course, the above discussions may seem a bit abstract but they are actually essential if one wants to interpret the data well. For example, do asset purchase programmes shown in Figure 3 clearly add liquidity to the financial system? They do add to excess liquidity according to the most standard definition of liquidity, which was mentioned before.

At the same time, if one takes a more economic view of liquidity, centering around a liquid instrument created in the market, then central banks buying assets which were already liquid, are not clearly adding much liquidity to the system. Lending against a Treasury bond creates liquidity but only if that Treasury bond was not being used elsewhere as helping provide liquidity. Some economists even consider that Treasury bonds are a form of money (Krishnamurthy & Vissing-Jorgensen, 2012) Similarly, if a central bank buys collateral which is already high quality, and liquid in itself on financial markets, then it's not clear whether swapping such an asset with central bank money really adds much liquidity to the system. For this reason, the numbers for "excess liquidity" given before should perhaps be put into some perspective depending on one's definition of liquidity.

Finally, Figure 4 shows the annual growth rate in monetary aggregates, with an unprecedented decline at least since 1980 in M1 as well as a large drop in M3 [4]. This large decline in M1 reflects the repayment of TLTROs, as well as the effects of (very gradual) quantitative tightening. The drop in lending by banks reflected in M3 is also not surprising given the increase in interest rates which is discouraging borrowing by both firms and households. Monetary policy transmission is thus quite effective in that the rise in short term rates does indeed transmit into the higher end of the yield curve (higher long-term rates) as well as lower lending volumes by both firms and households, which is used to slow down the euro area economy.

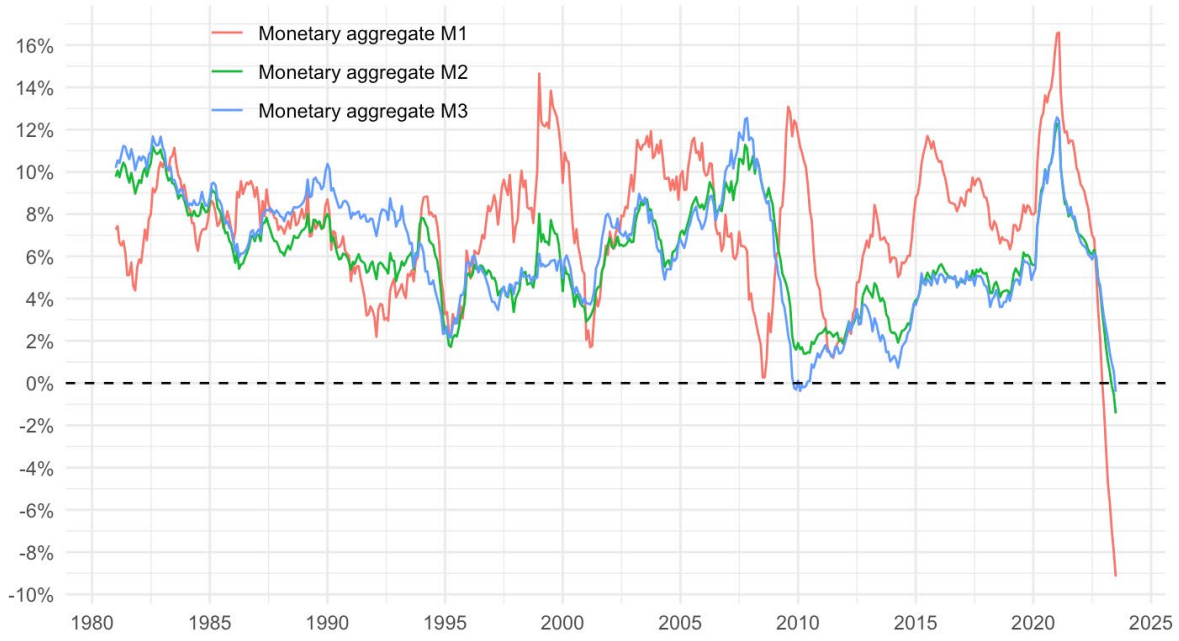
[4] M1 is the sum of the most liquid liabilities of both the central bank and commercial banks (currency in circulation, overnight deposits). M3 also includes deposits with a longer maturity (up to 2 years), repurchase agreements and money market instruments.

Figure 3: ECB's asset purchase programmes (ABSPP, CBPPs, CSPP, PEPP, PSPP, SMP), holdings



Source: ECB, authors' calculation.

Figure 4: Annual growth rate in monetary aggregates: M1, M2, M3



Source: ECB, authors' calculation.

4. KEY ISSUES AND IMPLICATIONS OF THE FLOOR AND CORRIDOR SYSTEMS

The rise of excess liquidity that the former sections have discussed has been an indirect consequence of the shift of the monetary stance towards more accommodation when policy rates had hit the zero (or effective) lower bound. It is this change in the monetary stance that has required a change in the operational framework of the ECB.

The operational framework depends on the structure of the financial system, notably the role of banks and financial markets in the financing of non-financial agents. The operational framework has implications on the ability of central banks to control the interest rate that matters for monetary policy and on the provision of liquidity that matters for financial stability. The money supplied by central banks – also called monetary base or high-powered money – consists in banknotes, held by the public, and reserves, which can only be held by commercial banks as deposits at the central bank. While the public needs banknotes for transactions, banks use reserves to comply with required minimum reserves, make transactions with other banks and satisfy their objective of liquid assets holding. For central banks, liquidity management boils down to the setting of the appropriate amount of reserves supplied to the financial system.[5]

Central banks may then either opt for a corridor system or for a floor system.[6] As will be explained below, the nature of the equilibrium for overnight interest rates crucially depends on the system adopted by the central bank.[7]

4.1. Monetary policy with or without abundant reserves

In the euro area, the ECB sets three policy rates: marginal lending facility rate (MLF), MRO rate and DFR. The MRO rate is the minimum interest rate applied to weekly liquidity operations proposed by the ECB. Commercial banks can also obtain overnight liquidity or place overnight deposits through the standing facilities – lending and deposits – at interest rates respectively above and below the MRO rate. Thus, in a corridor system, the interest rate on the MLF normally provides a ceiling for the overnight interbank market interest rate and the DFR provides a floor.

The ECB requires commercial banks to hold required minimum reserves and provides them with liquidity through regular main and longer-term refinancing operations. Banks may also hold deposits above required reserves. These excess reserves may be transformed into deposit facilities or remain on the current account as excess reserves.[8]

In both the corridor and the floor systems, the demand for reserves (by banks) decreases with the overnight interest rate. Under the corridor system, the ECB adjusts the supply of reserve through liquidity operations to bring the euro area market overnight interest rate (EONIA before October 2019 and the Euro Short-Term Rate, €STR, after October 2019) as close as possible to the MRO rate. Thus, the MRO is the interest rate targeted by the ECB to signal the stance of monetary policy. The supply of reserves is calculated to avoid excessive fluctuations of the overnight interest rate.[9] Consequently, the

[5] In practice, the ECB sets the amount allotted through refinancing operations – MRO and LTRO – and may decide to purchase securities. Reserves are thus the counterparts of these liquidity operations and asset purchases.

[6] See Keister (2012) for a presentation of the two systems.

[7] The overnight interest rate is a market rate at which banks borrow and lend to each other overnight.

[8] The remuneration of excess reserves and deposit facilities may differ, thus triggering trade-offs.

[9] To that end, the Eurosystem mainly needs to assess the components determining the demand for reserves of the banking system. It depends on minimum required reserves but also on the autonomous factors, not controlled by the central bank.

ECB needs to anticipate the liquidity needs of banks. In such a system, there is no – or only a small amount – of reserves beyond required reserves. Under the floor system, the supply of reserves exceeds the demand from banks and therefore results in excess reserves and extra deposit facilities.[10] As a consequence, the market overnight interest rate is in theory stuck to the DFR, which becomes de facto the target policy rate of the ECB. Things are somewhat more complicated in practice due to the so-called "leaky floor" issue: as shown on Figure 5, the overnight interest rate can in fact go below the deposit rate, because non-bank financial institutions which do not have access to the central banks' facilities cannot deposit at the central bank. To deposit their funds at the central bank, non-banks have no other choice than to lend to banks on the money market, and in so doing pay an intermediation fee in the form of a lower interest rate. In such a situation, the overnight interest rate can go lower than the deposit rate.

Figure 5 illustrates the difference between the two systems. From January 1999 to October 2008, the overnight interest rates closely fluctuated around the MRO rate and the amount of excess reserves (plus deposit facilities) was close to zero on average.[11] The implementation of non-standard measures after October 2008 has triggered an increase in the amount of reserves exceeding required reserves and pushed the overnight rate down to the DFR.

While the introduction of the floor system coincided with the introduction of unconventional measures during the GFC, there is no a priori reason that the system may not subsist in a "normal" situation. Indeed, the floor system has neither prevented the ECB from tightening monetary policy since July 2022, by increasing the MRO rate and the DFR, nor from starting the phasing out unconventional measures.[12] As illustrated in Figure 1, the €STR has largely increased after the decisions of the ECB to tighten monetary policy. In August, it was around 3.75%, the DFR, which remains de facto the target for the policy rate.

It is noteworthy that whatever the monetary policy system – corridor or floor –, the ECB will still able to steer the overnight rate (the short end of the yield curve). Moreover, monetary policy decisions on the policy rate have also been passed-through the long end of the yield curve (Figure 6).[13] Consequently, the choice of the system does not seem to impinge on the transmission of interest rate decisions. However, if the ECB aims at keeping asset purchases in its toolbox, it will have to maintain the floor system. The choice of the system is related to the choice of the instrument of monetary policy but in both systems, the transmission channels of decisions are unaffected.

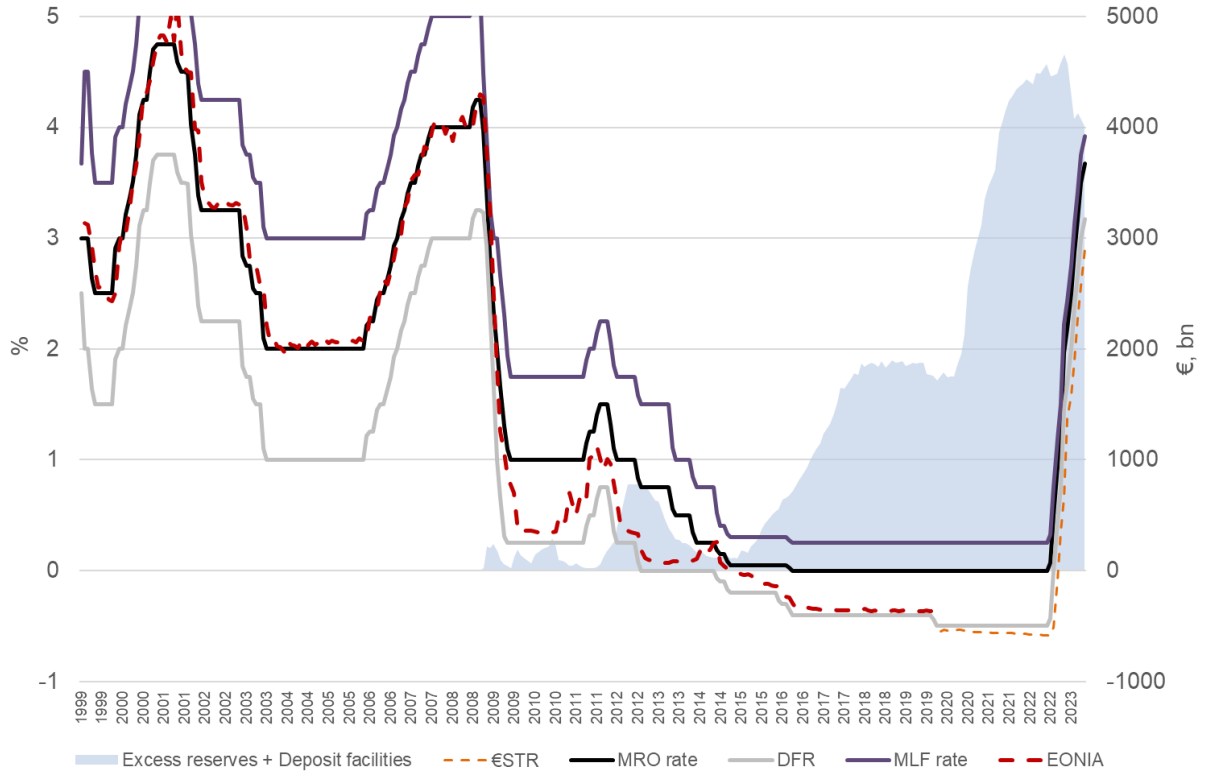
[10] It may be noticed that under the floor system, banks have a large access to liquidity notably because of the Fixed-rate / Full-allotment policy (FR/FA). All liquidity needs are satisfied by the ECB. However, in reality, the access to central bank's liquidity is not unlimited since commercial banks may obtain liquidity as long as they are able to provide collateral.

[11] On a daily basis, fluctuations of the overnight rate around the MRO are more volatile (See Figure 11 in Appendix) and excess reserves also exhibit some volatility around zero before October 2008 (See Figure 12 in the Appendix).

[12] The implementation of non-standard measures aimed at providing additional liquidity to reduce financial instability and to circumvent the zero lower bound.

[13] Even though we observe a reversion of the yield curve, it is not specific to the floor system and such a feature has already been observed before.

Figure 5: Excess reserves and deposit facilities in the euro area, in EUR billion



Source: ECB.

Note: the EONIA rate was the reference for the overnight interbank market until September 2019. The €STR replaced the EONIA as a reference since October 2019 as the regulator considered that the EONIA was not robust and reliable. The €STR is exclusively based on borrowing transactions in euro conducted with financial counterparties (including non-bank financial institutions) that banks report to the ECB.

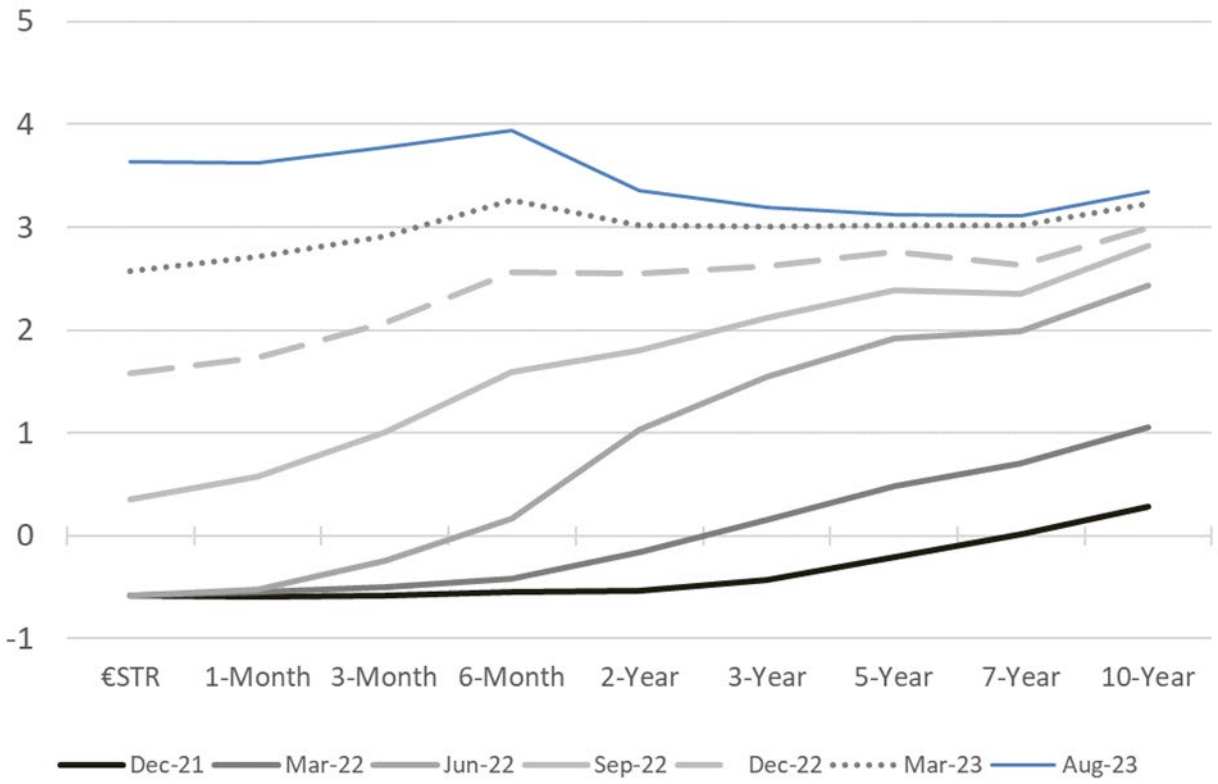
It is noteworthy as well that changes in the amounts of excess reserves and the transmission of monetary policy decisions have been disconnected. While returning to a corridor system can only be realised if the amount of excess reserves converges to zero, the recent decrease in excess reserves following the repayment of liquidity operations (TLTRO III) has not been reflected in the overnight rate since excess reserves and deposit facilities remain positive, as a counterpart to the holding of securities (mainly Treasuries) held for monetary purposes within the APP (See Figure 13 in the Annex).

Consequently, the choice between a corridor and a floor system would apparently not be a crucial issue for monetary policy. Yet, reverting to a corridor system will translate into a de facto tightening of monetary policy of ½ point that corresponds to the convergence of the overnight interest rate from the DFR (where it stands under the floor system) to the MRO rate (where it will stand under the corridor system). In this respect, the ECB will have to deliver clear communication on this policy shift. This decision also necessarily involves a sharp reduction of the size of the Eurosystem's balance sheet via the decrease of securities holdings. Such a decision involving quantitative tightening will not be neutral for financing conditions and thus for the implicit stance of monetary policy. Choi et al. (2022) have quantified the effect of the phasing out of US non-standard measures by the Fed. To that end, they calculate a proxy for policy rate accounting for non-standard measures and suggest that this implicit policy rate would have been 2 points higher than the Fed funds target in September 2022.

To sum up, the transition from a floor system to a corridor system could matter for the stance of monetary policy but less so on the channels of transmission. It remains to be discussed whether such a

transition could hamper financial stability since it would imply a reduction in the liquidity provided by the ECB.

Figure 6: The term structure of interest rates for the euro area, in %.



Source: Refinitiv Eikon Datastream.

4.2. Issues beyond monetary policy

As indicated above, the floor system inherently entails a supply of excess reserves. What are the benefits of maintaining excess reserves? Conversely, are there costs associated with a persistent level of excess reserves?

Commercial banks may desire to hold reserves beyond the need to fulfill minimum reserve requirements and for transactions with other banks. GFC has highlighted the key role of liquidity for financial stability and regulation has been strengthened to improve the ability of banks to deal with adverse liquidity shocks. Within Basel III post-crisis reforms, banks are now required to hold a sufficient reserve of high-quality liquid assets (HQLA) to ensure that they would be able to survive a period of liquidity stress. The Liquidity Coverage Ratio (LCR) should reach at least 100% of the total net cash flows over the next 30 calendar days. Reserves held at the ECB are considered as an asset that can be included in HQLA without limit. Beyond prudential regulation, commercial banks may have their own objectives of liquid assets creating a potential additional demand for reserves.

Borio (2023) emphasizes three potential costs if the floor system is maintained. First, as banks have a full access to the central bank's liquidity, they do not need to trade on the overnight market, which becomes withered. In a way, the floor system "kills" the overnight market. Borio (2023) also claims that transactions beyond the overnight market may be affected. Thus, we may fear that some skills have been lost if desks operating on the overnight market have been dismantled. This feature may be detrimental to non-bank financial intermediaries (NBFI) as they are more reliant on the interbank market

to have access to liquidity.[14] Second, even if banks have full access to central bank's liquidity, the demand for reserves may be bound by available eligible collateral. The higher the demand for reserves, the higher banks need to pledge collateral. The floor system may thus trigger collateral scarcity and market distortions.[15] The shortage of a good collateral may negatively affect access to liquidity and thus capital markets financing. Meanwhile, the PSPP also reduces the available collateral as more public securities are held by the ECB and less become traded between other financial investors. Finally, the provision of abundant liquidity at low cost – and even negative costs for some TLTRO operations – may be seen as a subsidy to the commercial banks.

4.2.1. Is interbank market frozen or "dead?

If the overnight market has been "killed" by excess reserves, it may be hard to revert to the corridor system. But the skills that have been lost can be found as long as banks are prepared, and a transition period is scheduled. The key issue is not about banks' capacities to trade in the overnight market but their willingness to trade. In the euro area, the floor system started because of important liquidity needs of banks that were not satisfied by the interbank market. The initial causality was thus reversed and excess reserves were needed because the overnight market was already "dead". The rise of excess reserves was mainly demand driven in the context of the GFC and then the sovereign debt crisis. Banks with high liquidity were reluctant to lend to banks with liquidity needs. The banking system required more intermediation from the ECB, especially banks in the periphery that had lost the ability to get refinancing from other banks. The role of the ECB was to meet this demand by changing the operational framework in order to provide abundant liquidity and thus avoid a widening of the financial stress. For instance, it proposed two liquidity operations in December 2011 and February 2012 with a three-year maturity (VLTRO). Those operations notably benefited banks in Italy and Spain that were the main bidder whereas German banks did not take much part to it (BIS, 2012). It resulted in a higher share of refinancing intermediated by the ECB, which reached a first peak above 15% (Figure 7). The ECB's intermediation has gained further importance for MFIs during the pandemic period as a consequence of the PELTRO and TLTRO.

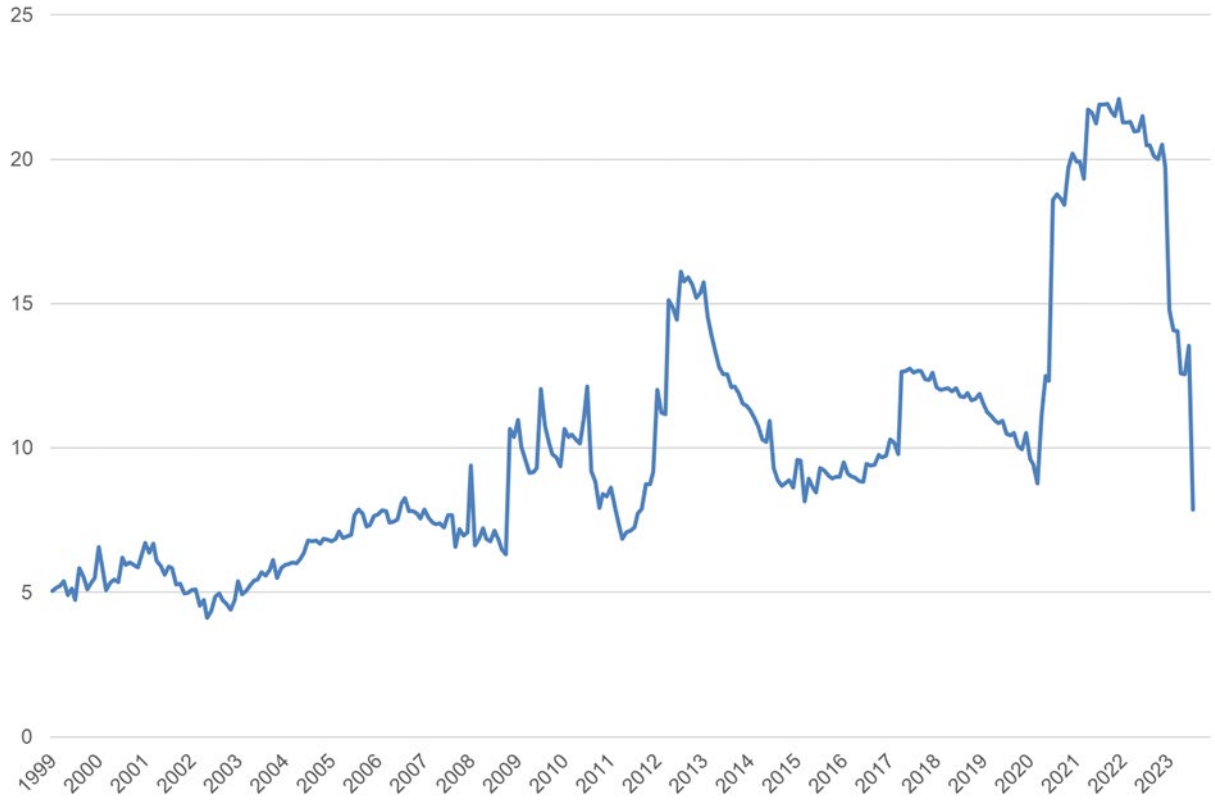
Is the interbank market still alive? It is hard to answer the question since it is of no utility in the current floor system with excess reserves. However, one can observe that the share of refinancing intermediated by the ECB has shrunk since the start of 2023 as some of those liquidity operations have come to an end. Such a reduction may be interpreted as a reduction in the demand for reserves in the banking system. However, the level of banks' current account balances exceeding required reserves remains high because of the APP so that banks still benefit from abundant liquidity that was so far mostly supply-driven. The key issue is thus whether there may still be financial stress on interbank and sovereign markets that would require the floor system to remain in place.[16]

[14] NBFI have no access to the ECB liquidity operations.

[15] See Arrata et al. (2020).

[16] The sovereign debt crisis in the euro has highlighted how sovereigns and banks are interconnected. See Shambaugh (2012).

Figure 7: Interbank refinancing intermediated by the ECB, in %



Sources: ECB, authors' calculations.

Notes: the ratio of ECB's intermediation is computed as the share of ECB lending to euro area monetary financial institutions (MFI) on MFI's total deposits.

As a consequence, there is uncertainty about the risk of reverting to a corridor system. The weakness of interbank markets mainly reflects the fact that reserves are still abundant as a consequence of the floor system. It cannot strictly be interpreted as the evidence of a fragmented euro area interbank market. It remains that money markets may be less predictable than in the past. In September 2019, a sudden stress in the US repo market led the Federal Reserve to intervene and supply more reserves interrupting the reduction of its balance sheet, which had been initiated in the end of 2017. The bankruptcy of some important but not major banks in the US and the troubles of Credit Suisse in Europe have revived concerns about banks' fragility. Although this episode cannot be compared to the banking system crisis of 2007-2008, it recalls that financial stability cannot be overlooked.[17]

4.2.2. The need of excess reserves to satisfy the demand for liquid/safe assets

Beyond the need to satisfy the LCR, commercial banks may desire to hold a higher share of liquid and safe assets. Central bank reserves meet these two features of being liquid and safe. Greenwood, Hanson & Stein (2013) claim that there may be some benefits of keeping abundant reserves for financial stability. As central banks have the monopoly power to issue reserves, they are able to provide an additional source of a safe assets that would be an alternative to other safe securities such as short-term Treasury bills. This would notably matter if the stock of Treasury securities is limited. The supply of reserves by central banks does not face the same constraints which may make them an appealing source of liquidity especially if governments aim to reduce public debt – and thus issue less securities – or if financial

[17] In September 2019, a sudden stress in the US repo market has led the Federal Reserve to intervene and supply more reserves interrupting the reduction of its balance sheet.

investors do not view all Treasury securities as safe assets. Caballero et al. (2017) argue that the list of safe assets has been reduced after the GFC, with the notable exclusion of Italian and Spanish sovereign securities.

In the extreme case where Italian and Spanish short-term Treasury securities are not be considered as a safe asset, only French and German Treasury bills would satisfy the demand for liquid and safe assets. If we consider that demand for liquid grows with the size of MFIs, Treasury bills may represent at least a constant share of their balance sheet.[18] In 2007, securities issued by the four major euro area countries (considered safe assets at the time) represented 16.7% of the MFIs balance-sheet. In 2022, if only the German and French bonds are viewed as safe and liquid, the demand for liquid and safe assets would not be satisfied as both securities represent 14% of the balance sheet (Figure 8).[19] Consequently, if the French and the German governments do not increase their supply of securities, there may be a lack of safe and liquid assets denominated in euros.[20] It remains that the rise of public debt is not compatible with existing fiscal rules. In practice, only Germany might be able to issue additional safe assets as German public debt is below 70% of GDP in 2022 (and close to the debt target at 60% of GDP) whereas France, Italy and Spain exceed 110% of GDP. But German national fiscal rules may certainly impede the supply of debt so that maintaining a floor system with abundant reserves issued by the ECB could be viewed as an alternative: it would permit banks to continue holding excess reserves for financial and banking stability reasons in a lower public debt environment.

4.2.3. Supplying excess reserves through asset purchases or liquidity operations

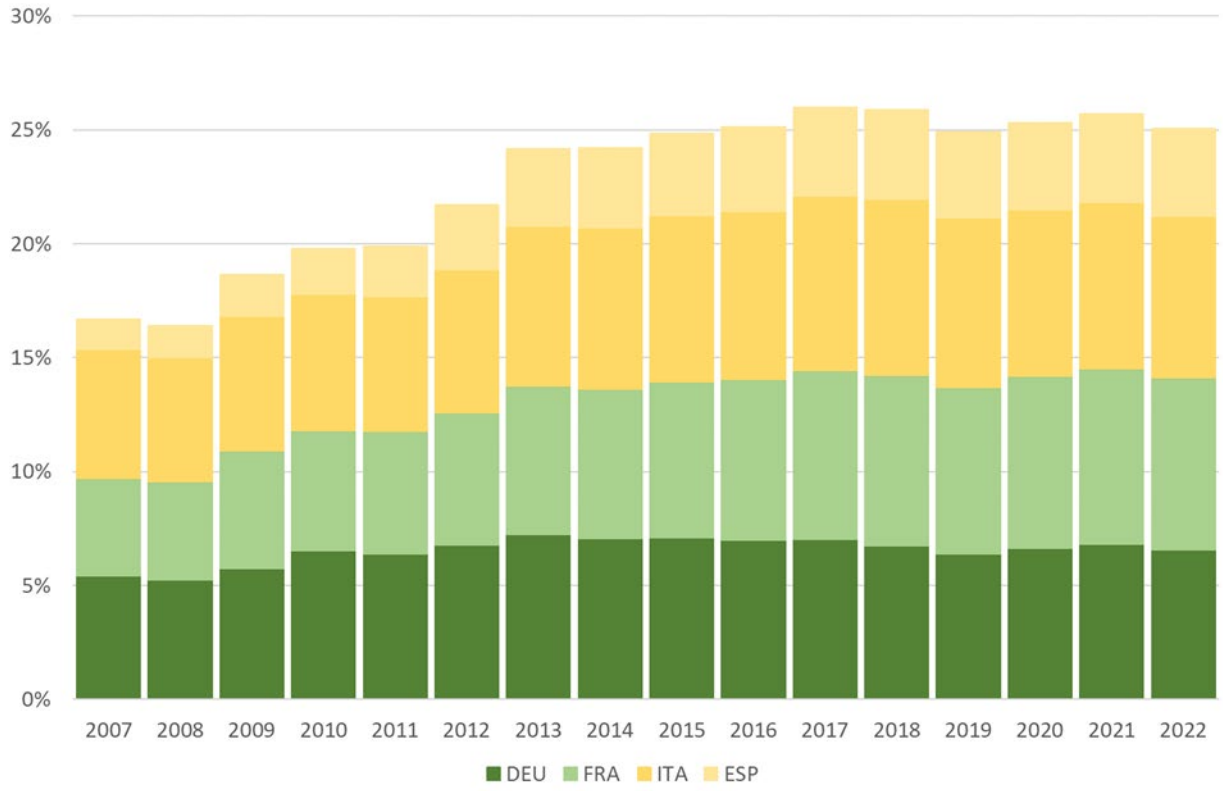
In the case where it would be desirable to maintain an abundant level of central bank reserves, the ECB should decide whether those reserves are created through asset purchases or by liquidity operations. If the ECB needed to adjust asset purchases in order to meet the need of liquid asset. It would entail an alternance of periods of QE and QT that may interact with the decisions on the short-term policy rate. For instance, the ECB may decide to tighten monetary policy but need to issue additional reserves through purchases of additional long-term debt. Decisions on the short-term policy rate would be for monetary purpose whereas asset purchases would be taken for financial stability. As the transmission of monetary policy hinges on its pass-through to other interest rates, there would be inevitably interactions between the price stability objective and the financial stability objective.

[18] Actually, it may even be a growing share of the financial system.

[19] Public debt is measured as the total debt of the public sector, including federal and local governments.

[20] It is not yet clear what would be the share of public securities held by MFIs if the Eurosystem would not have bought a large share of newly issued Treasury securities.

Figure 8: Public debt in % of the size of MFIs total assets



Sources: ECB, Eurostat, authors calculations.

Moreover, the purchase of public securities by the Eurosystem would reinforce the scarcity effects emphasized above, particularly for less abundant securities such as German bonds. Therefore, it is not clear that this option would solve the problem of availability of safe liquid assets.[21] To circumvent this shortcoming, it would be needed to buy public securities issued by countries where securities are not viewed as safe assets by financial investors. In other words, the ECB would transform "unsafe" securities issued by Italy and Spain into "safe" reserves. This option entails regular and even permanent deviations form capital keys and thus potential distributive effects of ECB decisions.

The alternative is to provide reserves through liquidity operations. In that case, the ECB would offer important amount of refinancing by maintaining "special" (targeted or long-term) refinancing operations (with full allotment) to satisfy a potential demand. There would be no distortions on sovereign markets and it would be demand driven whereas it is supply driven if it is related to asset purchases. This scenario is close to the choice made by the ECB at the beginning of the GFC. Liquidity operations would be decoupled from the monetary policy stance. A separation principle would prevail.[22]

In both cases, there is uncertainty concerning the equilibrium level of reserves that would be needed to maintain the floor system and meet the demand of safe liquid assets. At the end, it crucially depends on the level of excess reserves needed to reach the flat part of the demand curve. However, estimating the floor level of excess liquidity is a tricky issue (Åberg et al., 2021).

[21] The constraint may be less binding if one considers that keeping an asset purchase programme may not imply rising purchases. The system may be maintained but with periods of QE and periods of QT. The Eurosystem would hold a variable amount of Treasury securities and adjust its purchases according to financial stability motives.

[22] Bordes & Clerc, 2013.

5. CONCLUSION

The transmission of monetary policy and the management of liquidity play crucial roles in ensuring adequate financing conditions for households and non-financial corporations. The global financial crisis prompted central banks, including the ECB, to adopt unconventional measures, such as asset purchases and liquidity operations, to support expansionary monetary policy and enhance financial stability.

The ECB's shift from a corridor system to a floor system resulted in the accumulation of excess liquidity by banks, contributing to the ongoing challenges in defining and measuring liquidity in the euro area. The ECB has made efforts to implement a more restrictive stance. Meanwhile, excess liquidity has remained at a relatively high level, prompting questions about the most appropriate operational framework for the euro area. But given the size of the Eurosystem's balance sheet (and taking into account the current gradual approach to QT), excess liquidity is here to stay as it will take some times to reduce holdings of those securities without triggering large asset price swings.

This paper highlights the importance of evaluating the long-term implications of different operational frameworks on monetary policy effectiveness and financial stability. The interplay between market liquidity and funding liquidity further emphasizes the need for a comprehensive understanding of liquidity dynamics in order to anticipate and mitigate potential risks.

To ensure a "normal" situation with positive interest rates, it is vital to consider the potential consequences of returning to pre-crisis frameworks for the implementation of monetary policy. Whether the ECB maintains the current floor system or reverts to the corridor system, thorough assessments of their impact on financial stability should be conducted.

Furthermore, a holistic perspective on liquidity, taking into account both central bank liquidity provision and liquidity provided by financial institutions, to both banks and non-banks which do not currently have access to central banks' facilities, is essential for maintaining smooth functioning of financial markets and avoiding potential liquidity crises. Understanding the intricate relationship between market liquidity and funding liquidity provides important insights into the dynamics of asset values and their impact on market stability.

In summary, this paper emphasizes the significance of liquidity management in the context of monetary policy transmission and financial stability. By critically examining operational frameworks, liquidity definitions, and the interdependence between different forms of liquidity, policymakers and market participants can make informed decisions to foster stable and resilient financial systems.

Finally, it can be stated that in a way, monetary policy has been successful in achieving the objectives it had set for itself. Liquidity has started to dry up, which is what the ECB wanted, probably in order to cool lending and, from a monetary perspective, to decrease inflationary pressures. However, one can wonder whether such a decrease in lending should be seen as good news given that inflationary pressures have been triggered by a negative supply shock, and that the euro area is approaching closer to recessionary territories.

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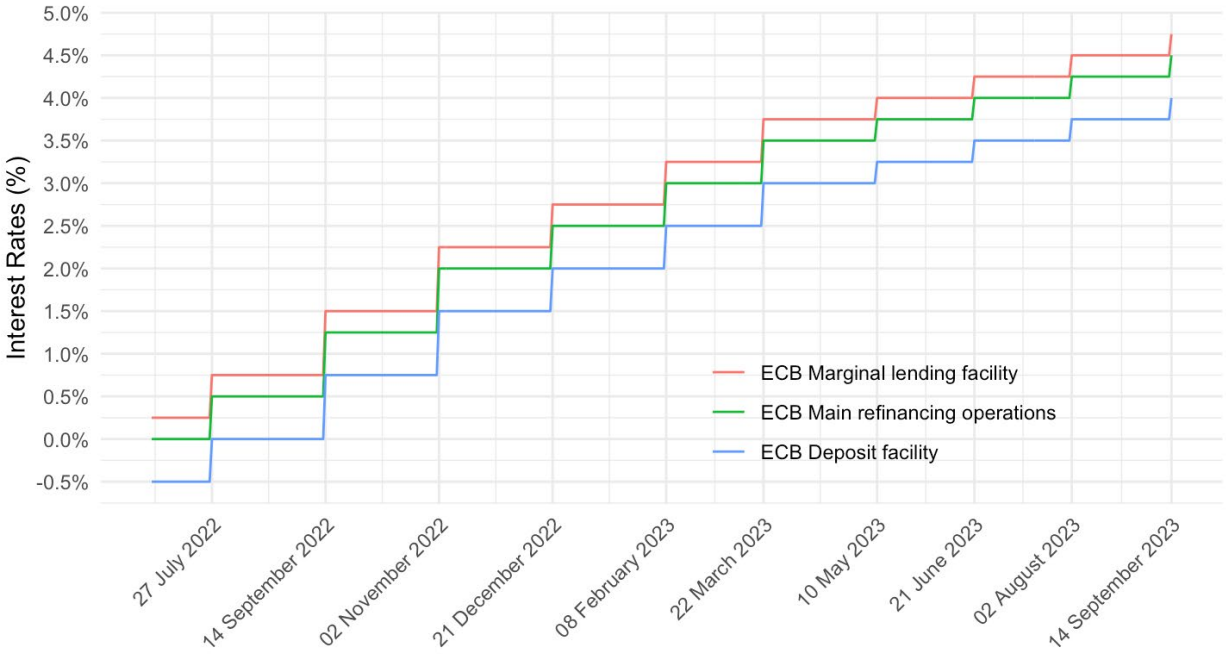
ANNEX

Figure 9: Dates of change of Key policy interest rates

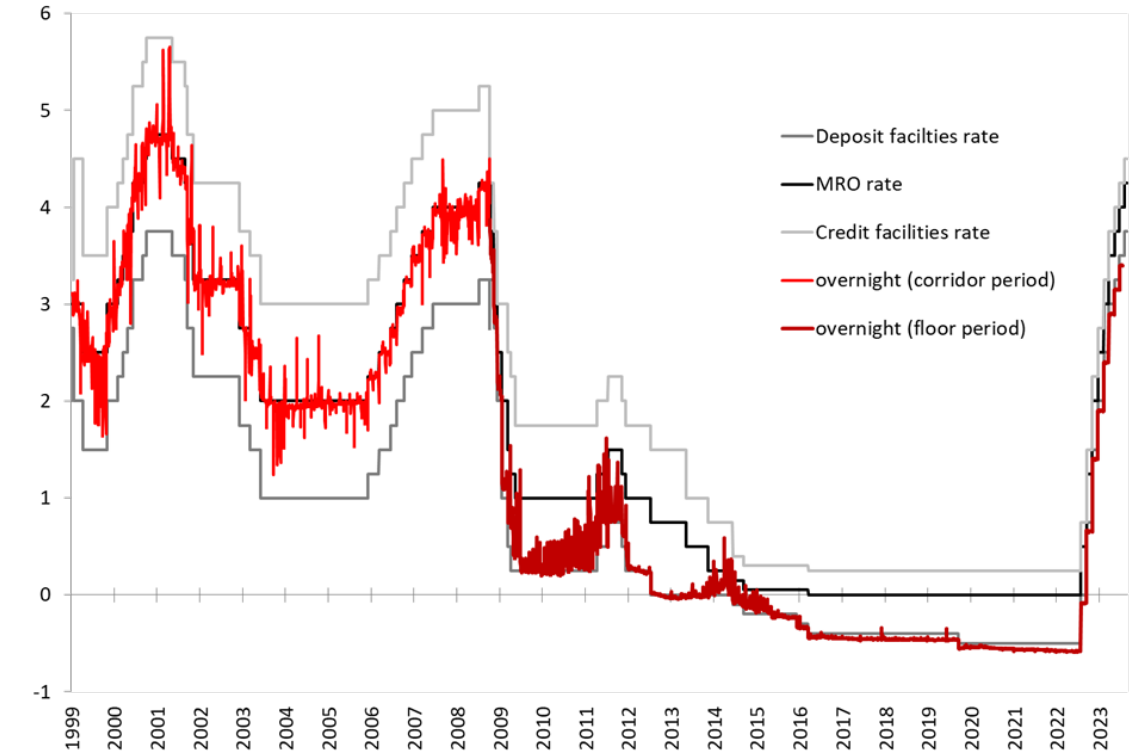


Sources ECB.

Figure 10: Main refinancing operation in the Eurosystem

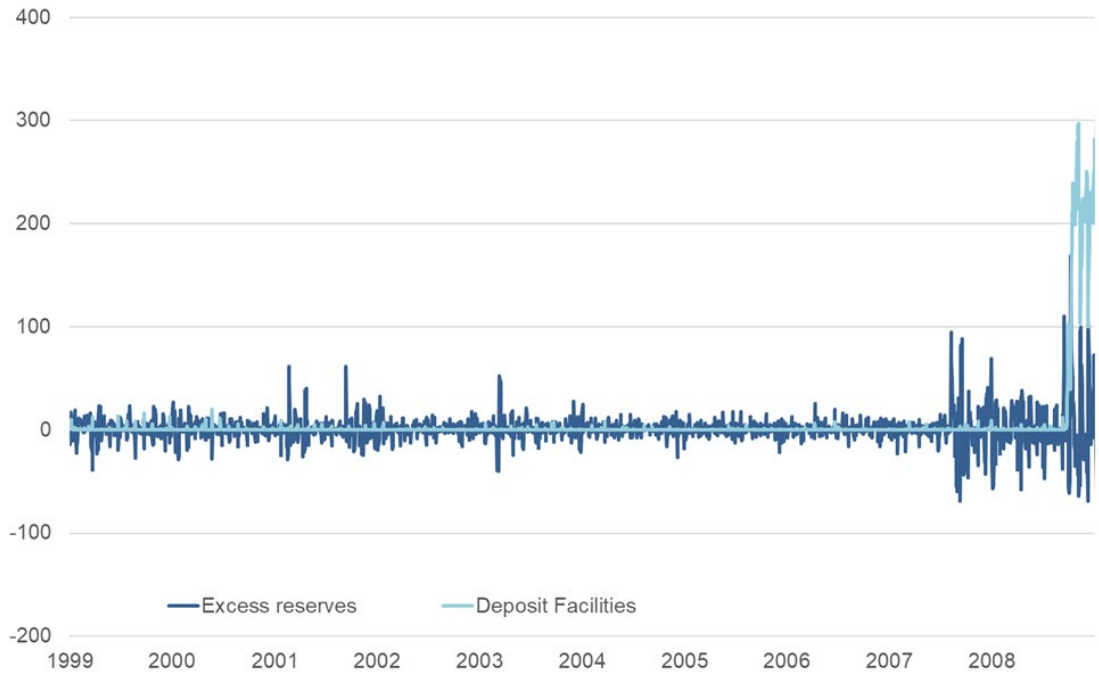
Sources ECB.

Figure 11: Overnight and policy rates, in %



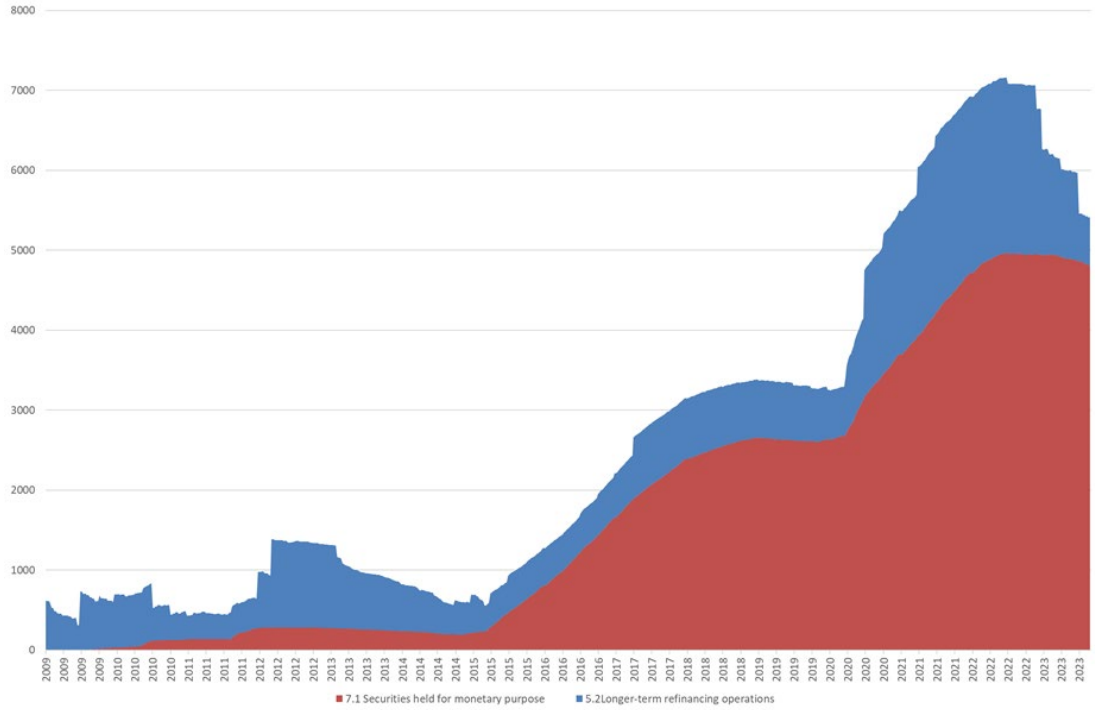
Sources ECB.

Figure 12: Reserves and deposit facilities, in € bn



Sources ECB.

Figure 13: Main counterparties to excess reserves and deposit facilities, in € bn



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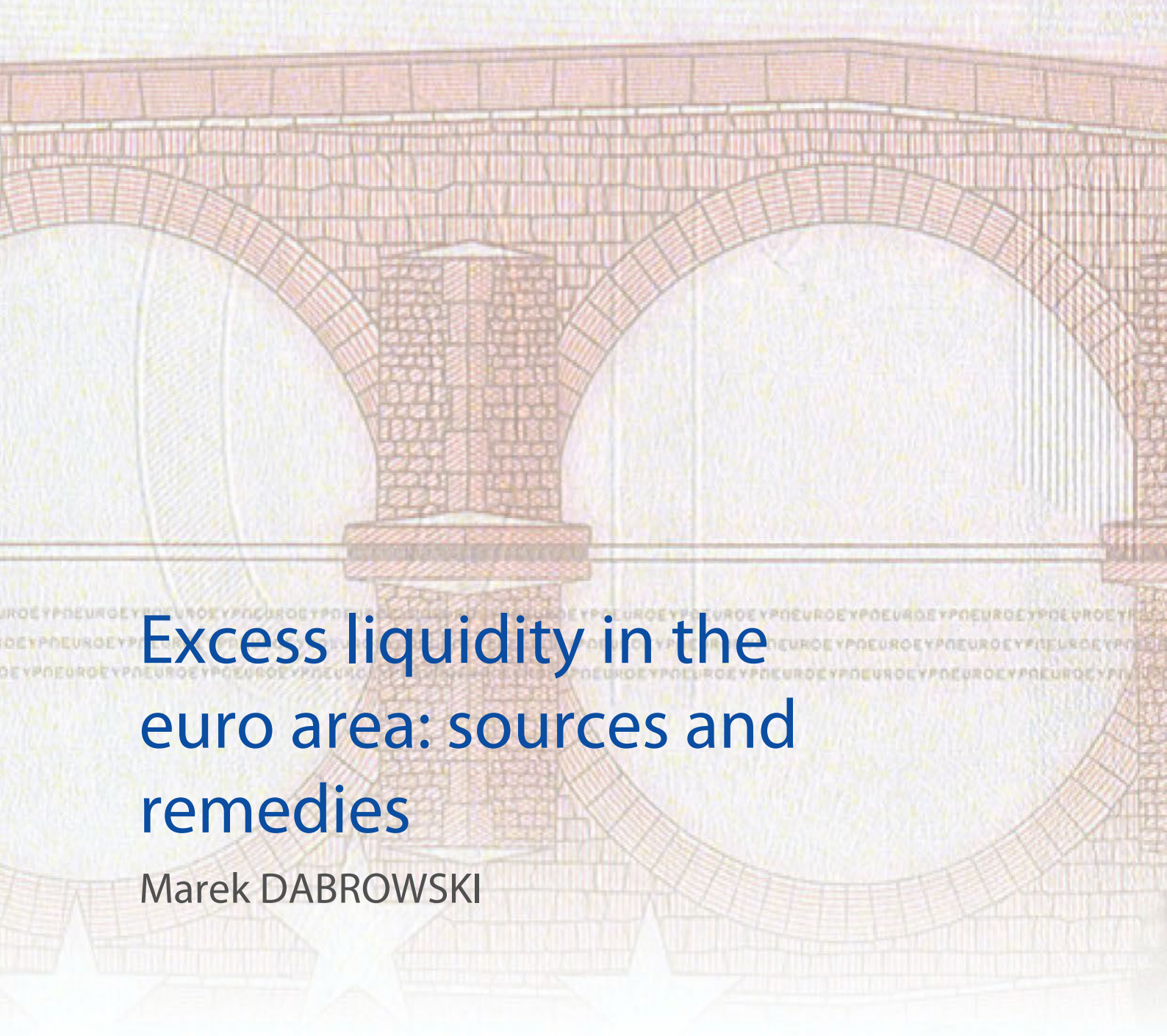

Excess liquidity in the euro area: sources and remedies

Marek DABROWSKI

Abstract

The excess liquidity in the euro area is a product of a long period of quantitative easing. It changed the operational framework of the European Central Bank (ECB)'s monetary policy from the scarce reserves system (SRS) to the abundant reserves system (ARS). To eliminate excess liquidity and return to the SRS, the ECB must intensify quantitative tightening, which is also essential for successful disinflation. Fiscal adjustment can help in this process and mitigate the risk of financial instability.

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CONTENTS

LIST OF ABBREVIATIONS

ABSPP	Asset-Backed Securities Purchase Programme
AEs	Advanced economies
APP	Asset Purchase Programme
ARS	Abundant Reserves System
BoE	Bank of England
BoJ	Bank of Japan
CAR	Capital Adequacy Ratio
CB	Central bank
CBPP3	Third Covered Bond Purchase Programme
CHF	Swiss franc
CJEU	Court of Justice of the European Union
COVID-19	Coronavirus Disease 2019
CSPP	Corporate Sector Purchase Programme
DF	Deposit Facility
DFR	Deposit Facility Rate
ECB	European Central Bank
EFC	European Financial Crisis
EMEs	Emerging market economies
EONIA	Euro Overnight Index Average
EU	European Union
EUR	Euro
Fed	(US) Federal Reserve Board
FFR	Federal Fund Rate

FSB	Financial Stability Board
GDP	Gross domestic product
GFC	Global Financial Crisis
HQLA	High-quality liquid assets
IMF	International Monetary Fund
IORB	Interest on reserve balances
JPY	Japanese yen
LCR	Liquidity Coverage Ratio
LHS	Left-hand side
M1, M2	broad money aggregates
MLF	Marginal Lending Facility
MRO	Main Refinancing Operations
NDAs	Net Domestic Assets
NFAs	Net Foreign Assets
OIN	Other Items Net
OMOs	Open market operations
OMT	Outright Monetary Transactions
PEPP	Pandemic emergency purchase programme
PSPP	Public Sector Purchase Programme
QE	Quantitative Easing
QFAs	Quasi-Fiscal Activities
QT	Quantitative Tightening
RHS	Right-hand side
SMP	Security Market Programme

SRS	Scarce Reserves System
SNB	Swiss National Bank
SVB	Silicon Valley Bank
SWF	Sovereign Wealth Fund
TFEU	Treaty on the Functioning of the European Union
TLTRO	Targeted longer-term refinancing operations
UK	United Kingdom
UMPMs	Unconventional monetary policy measures
US	United States
USD	US dollar
YCC	Yield curve control
€STR	Euro short-term rate

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EXECUTIVE SUMMARY

- **As in other advanced economies, excess liquidity in the euro area financial system is a relatively new phenomenon**. It became a permanent feature in 2015 after the European Central Bank (ECB) launched mass-scale quantitative easing (QE).
- **Before the global financial crisis (GFC) of 2007–2009,** the ECB's monetary policy was conducted within the scarce reserves system (SRS), also called the "corridor" system. Commercial banks operated in an environment of structural liquidity deficit. The ECB supplied them with liquidity through open market operations (repo transactions). It allowed a single monetary policy instrument to be applied: the main refinancing operations (MRO) rate.
- **Adopting unconventional monetary policy measures (UMPMs) after the GFC, particularly QE, led to a** significant increase in the ECB's balance sheet and excess liquidity in the financial system. To absorb part of this excess liquidity, the ECB had to use the deposit facility rate (DFR) and reverse repo transactions, moving from the SRS to the abundant reserves system (ARS), also called the "floor" system.
- **The SRS has several operational and institutional advantages over the ARS.** The start of the monetary tightening cycle in 2022, including the downsizing of the ECB's balance sheet, creates an opportunity to return to the SRS.
- **Returning to the SRS requires the continuation of quantitative tightening (QT)** but at a much faster pace than to date. The current rate of reduction in securities holdings (EUR 27 billion per month) will allow a return to the pre-pandemic level of ECB assets no earlier than eight years from now.
- **Intensification of QT is also essential for completing the disinflation process in a relatively short time and reducing the ECB's fiscal dependence.**
- **Other measures aimed at reducing excess short-term liquidity** in the euro area, such as gradual repayment of the targeted longer-term refinancing operations (TLTRO) (ongoing), increasing minimum reserve requirements, or conversion of overnight deposits at the ECB into long-term ECB liabilities, can play a supportive role in the transition to the SRS but cannot substitute large-scale QT.
- **Monetary policy tightening often involves a risk of financial instability**. In the current tightening cycle, this risk is magnified by a long period of near-zero interest rates, abundant liquidity, and a record-high level of public debt in advanced economies (AEs). The latter is detrimental to the stability of government finances and indirectly to commercial banks and non-banking financial institutions heavily exposed to government bonds.
- Therefore, **in the most indebted countries, fiscal adjustment must be seen as the primary flanking measure,** decreasing the risk of financial instability in the euro area during monetary tightening and QT. Other safeguard measures should include strengthening financial supervision and macroprudential regulations.

1. INTRODUCTION

As in other advanced economies (AEs), excess liquidity in the euro area financial system is a relatively new phenomenon. It appeared as a permanent feature in 2015 after the European Central Bank (ECB) launched a mass-scale asset purchase programme (APP), popularly called quantitative easing (QE). It substantially changed the operational conditions of the euro area's monetary policy. The pace of the ECB's base money[23] growth significantly exceeded the banking sector's demand, resulting in the rapid growth of excess reserves of commercial banks at the ECB. In such a situation, continuing the hitherto scarce reserves system (SRS) with the crucial role of the main refinancing operations (MRO) rate was no longer possible. It had to be replaced with an abundant reserves system (ARS) in which the deposit facility rate (DFR) became the key ECB instrument (Borio, 2023; Schnabel, 2023).

Several questions arise with the ongoing monetary policy tightening and the Eurosystem's balance sheet reduction, popularly called quantitative tightening (QT). First of all, how far should the QT should go? Second, what are the risks for the euro area financial system? Third, how can these risks be mitigated? Fourth, should the QT be accompanied by a return to the previous operational regime of monetary policy (SRS)? Fifth, is a return to the SRS possible without substantially reducing the Eurosystem's balance sheet?

This paper argues that: (i) from the operational and institutional perspectives, the SRS has several advantages over the ARS; (ii) a return to the SRS would be difficult without a substantial reduction of the Eurosystem's balance sheet, (iii) QT is also essential for the success of disinflation policy in the euro area, and (iv) the risks to financial stability can be mitigated primarily by fiscal adjustment in the euro area, especially in the most indebted countries.

The paper is organised as follows. Section 2 briefly analyses excess liquidity from an operational monetary policy perspective and its roots and consequences. Section 3 presents a history of building excess liquidity in the euro area and its dynamics over time. Section 4 discusses how to move back from the ARS to the SRS and presents other arguments favouring QT along with flanking measures, mainly in fiscal policy. Section 5 presents a summary of the analysis and policy recommendations.

When possible and justified, the situation of the ECB is compared with other major CBs in AEs, in the first instance, the Federal Reserve System (Fed) of the United States (US). The analysis uses the statistical data of the ECB, the International Monetary Fund (IMF), the Fed and other central banks.

[23] Base money is money created by a central bank (CB). Alternatively, in economic literature it is called reserve money, monetary base, central bank money, and high-powered money.

2. EXCESS LIQUIDITY: CONCEPTUAL ISSUES

In this section, we discuss the definition of excess liquidity (Subsection 2.1), its sources (Subsection 2.2), the impact of the size of the CB balance sheet on operational conditions of monetary policy (Subsection 2.3), differences between the SRC and ARC and their impact on the effectiveness of monetary policy (Subsection 2.4), and CB independence (Subsection 2.5).

2.1. Definition

Excess liquidity has various meanings, depending on whether one is analysing the micro or macro level, financial or non-financial sector, aggregate demand/money supply or CB liabilities. Due to its thematic agenda, this paper looks at the macroeconomic and macro-financial levels: the entire economy of a given currency area, the CB balance sheet, and the aggregate balance sheet of the banking/financial sector.

Within such a thematic scope, one can distinguish two kinds of definitions. The first and broader one refers to the excessive aggregate money supply in a given economy or globally, that is, exceeding economic agents' demand for money balances (see, e.g. Rueffer and Stracca, 2006), which leads to inflationary consequences. The second, narrower, refers to banking system liquidity exceeding the current liquidity needs of commercial banks and is reflected in the CB's liabilities. This is how the ECB defines excess liquidity[24].

Given the topic of this paper, our analysis concentrates on the narrower (or operational) second definition of excess liquidity. However, both concepts of liquidity (broader and narrower) are interlinked. As shown in Subsection 2.2, the excess liquidity in a narrower, operational sense is, in most cases, impossible without excessive money creation by the CB or banking system. Conversely, the excess liquidity of the banking system, if not effectively sterilised by the CB, may lead to excessive money supply and inflationary consequences. Therefore, we cannot avoid analysing excess liquidity in a broader sense.

2.2. Sources of excess liquidity

To understand sources of excess liquidity in a narrower, operational sense, one must start the analysis from the structure of the CB balance sheet (Figure 1).

Figure 1: Stylised CB balance sheet

Assets	Liabilities
Net foreign assets (NFAs)	Cash in circulation
Net domestic assets (NDAs), of which	Commercial bank reserves, of which
net credit to the government	mandatory reserves
net credit to commercial banks/ financial institutions	voluntary (excess) reserves
Other items net (OIN)	CB capital

Source: Rule (2015) and author's own elaboration.

Analysis of the liabilities side suggests that voluntary (excess) reserves have a residual character at a given size of the CB balance sheet. There is no room for excess reserves if the CB balance sheet is small (because other factors determine CB capital, cash in circulation and mandatory reserves). When it grows beyond the demand for CB base money, it creates room for this item, other things being equal.

[24] See https://www.ecb.europa.eu/ecb/educational/explainers/tell-me-more/html/excess_liquidity.en.html

Alternatively, the additional supply of CB base money can be wholly or partly absorbed by the banking sector, that is, converted into broader money aggregates (for example, M2 and M3). If not matched by an increasing demand for money from economic agents, such an increase in broad money leads to higher inflation.

The total CB balance sheet increase can originate from a rise in NFAs or NDAs. In the second case, it may be a net credit to the government or a net credit to commercial banks and other financial institutions.

Historically, a rapid increase in CB base money was observed in several emerging-market economies (EMEs), particularly from the 1970s to the 1990s. It led to several episodes of high inflation, hyperinflation, and currency crises. In most cases, the excessive growth in base money was brought about by the monetary financing of a budget deficit, generous credit support for the banking sector, and CB quasi-fiscal activities (QFAs). In the early 21st century, monetary and fiscal policies in most EMEs became more prudent. As a result, excessive increases in NDAs were less frequent. However, the desire to increase resilience against adverse shocks led to the accumulation of large precautionary foreign exchange reserves by many EME CBs. Other EMEs built up large foreign exchange reserves for other policy reasons, such as stimulating exports via undervalued currency (which could be called a mercantilist policy) or avoiding currency appreciation during the commodity boom (favourable terms of trade shock).

Whatever the reason for increasing CB foreign exchange reserves, it leads to growing NFAs and CB balance sheets (base money). Suppose a CB wants to limit the absorption of additional base money by commercial banks and, therefore, the entire economy (to avoid inflationary consequences). In that case, it must "sterilise" its part by draining the excess liquidity, that is, voluntary commercial bank deposits in the CB. Suppose the increase in NFAs is accompanied by budget surpluses and the creation of sovereign wealth funds (SWFs), which invest their financial assets abroad. In that case, the "sterilisation" task becomes more manageable and less costly for the CB (see Subsection 2.4).

Between the 1980s and 2008, the CBs in most AEs did not experience the problem of excess liquidity. Their balance sheets were modest. They did not finance fiscal deficits or conduct QFAs. They did not need to hold large foreign exchange reserves because they followed floating exchange rate regimes after the demise of the Bretton Woods system in 1971[25], and their currencies enjoyed high credibility. Hence, both NDAs and NFAs were limited in size. Changes in net credit to commercial banks and other financial institutions were the main channel of money supply to the banking sector and the entire economy. Commercial banks were in the position of a structural liquidity deficit. As such, they were net borrowers from CBs.

The global financial crisis (GFC) of 2007–2009 fundamentally changed this situation. The collapse of financial intermediation increased the demand for CB base money from commercial banks and other financial institutions. The comprehensive reform of financial regulations after the GFC further increased this demand (see Box 1).

CBs first reacted conventionally, that is, by cutting their interest rates. However, this proved insufficient to satisfy the rapidly growing demand for CB base money and avoid deflation. CBs in AEs had to launch unconventional monetary policy tools, including APPs, which rapidly expanded NDAs and CB balance sheets.

[25] See https://www.imf.org/external/about/histend.htm

CBs treated APP/ QE as a monetary policy tool aimed at increasing the liquidity of the financial sector and its lending capacity. However, given the dominance of Treasury bonds in the purchased assets, they can be seen as an additional credit to the government (Dabrowski, 2022).

The Swiss National Bank (SNB) chose another strategy similar to the CBs in some EMEs. The rapid increase in international demand for the Swiss franc (CHF) and associated appreciation pressure led to interventions in the foreign exchange market and increased foreign exchange reserves/ NFAs. However, the implications for excess liquidity were the same as in the case of increasing NDAs.

The excess liquidity in the main currency areas since 2008 results from a rapid increase in CB balance sheets.

Box 1: Impact of post-GFC reform of financial regulation on CB balance sheets

Weak and outdated financial regulations were broadly considered one of the causes of the GFC. Therefore, adopting new, much stricter and more comprehensive financial regulations was the natural reaction to the crisis. Such regulations were adopted in individual jurisdictions, for example in the United States, European Union (EU), United Kingdom (UK), Switzerland, Japan, Canada, Sweden, other AEs, and several EMEs. However, there was also a coordinated effort within the G20 and the Financial Stability Board (FSB) to agree global regulatory standards, which resulted in a new set of regulations popularly called the Basel 3 standards.

The new banking regulations introduced, among other things, tighter capital adequacy ratios (CARs), liquidity coverage ratios (LCRs), and countercyclical capital buffers. All these regulations curbed commercial banks' room for lending expansion, and increased their demand for CB base money. On the one hand, they pushed for expansion of CB balance sheets (to meet a higher demand for base money). On the other, they neutralised the potential inflationary impact of rapid growth in CB assets via declining money multiplier.

The deflationary character of new financial regulations was disregarded by most monetary policy analysts for a quite long time (Dabrowski, 2023)

Source: Dabrowski (2015; 2023); https://www.bis.org/bcbs/basel3.htm?m=2572

2.3. Impact of the size of CB balance sheets on operational conditions of monetary policy

Suppose a CB's balance sheet is relatively small and the CB does not have sizeable voluntary deposits of commercial banks in its liabilities. In that case, the banking sector is in a structural liquidity deficit. The CB must conduct active credit operations to satisfy its liquidity needs (demand for base money), which means operating the SRS regime. The exact monetary policy instruments can differ between individual CBs. However, in the case of AEs, repo operations usually perform the primary role. They serve the purpose of aggregate liquidity supply to the banking sector. The key CB interest policy rates, such as the MRO rate of the ECB and the federal funds rate (FFR) of the US Fed, determine the banking sector's demand for liquidity supplied by CBs via open-market operations (OMOs) and its price (Luther, 2018).

Naturally, a CB looks at the aggregate situation of the financial sector. The position of individual commercial banks can differ depending on their business model and short-term factors. At a given time, some of them can have extra liquidity needs while others have a liquidity surplus. Usually, the interbank money market helps meet individual banks' demand and supply needs. CBs only satisfy marginal requirements via the overnight marginal lending and deposit windows. They are called the

marginal lending facility (MLF) and DF of the ECB[26]. At the US Fed, this role is played by the Discount Window and Overnight Reverse Repurchase Agreement Facility[27]. The marginal lending and deposit rates set the width of the interest rate corridor, while the key policy rate usually operates in the middle of this corridor. Hence, the SRS is often called a "corridor" system.

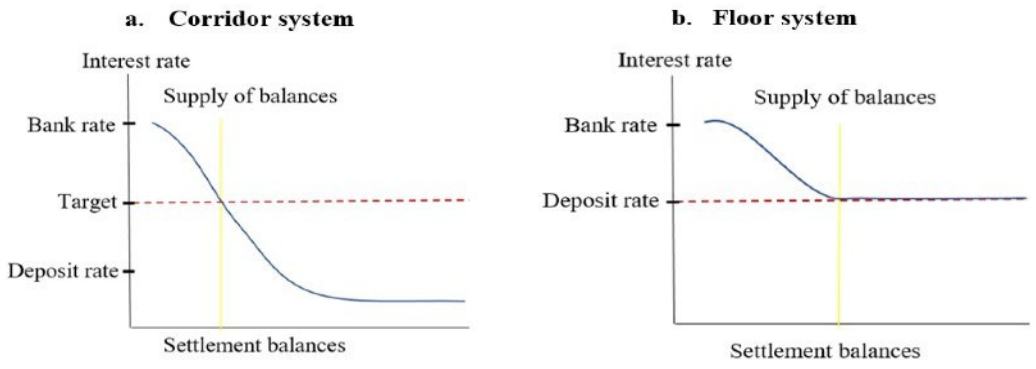
Operating SRS is impossible when a CB balance sheet is large because the banking system functions with a structural liquidity surplus. This is reflected in excess reserves (above the mandatory levels) in the CB balance sheet. The CB must borrow from commercial banks to conduct monetary policy instead of lending to them. Again, specific instruments can differ between currency areas (reverse repo, various deposit facilities, CB bonds, etc.), but the operational conditions of monetary policy change radically. The ARS replaces the SRS, and the deposit/reverse repo rate becomes the main monetary policy instrument. The interest rate corridor does not matter any longer. Therefore, the "corridor" system is replaced by a "floor" system, another term for the ARS. Commercial banks can decide how much liquidity they need and offer their surplus to the CB. The interbank market loses its importance and often dies.

2.4. Differences between the SRS and ARS and their impact on monetary policy effectiveness

Empirical experience demonstrates that monetary policy can be conducted operationally within the SRS and the ARS (Figure 2). However, there are differences between the two systems.

First of all, there is usually one policy instrument (a CB interest rate) under the SRS ("corridor system"). Under the ARS ("floor system"), monetary policy also regulates the size of the CB balance sheet (base money) via QE or QT (or their absence). Baglioni (2023) considers the availability of two instruments an advantage. He argues that "*the floor system gives central banks one more degree of freedom, since the interest rate policy and the balance sheet policy become two independent instruments, that can be targeted to different objectives*." However, others may see this argument as a disadvantage of ARS because it assumes a multi-task mandate of the CB, under which some tasks (supporting growth or rescuing insolvent banks) can contradict a price stability mission (Cukierman, 1996; Dabrowski, 2023) and compromise CB independence (see Subsection 2.5).

Figure 2: Operational differences between SRS ("corridor" system) and ARS ("floor" system)



Source: Gravelle et al. (2023)

[26] See https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html

[27] See https://www.federalreserve.gov/monetarypolicy.htm

In turn, when a CB has a single mandate (price stability), using more than one instrument contradicts the Tinbergen (1952) Rule, which says that optimally the number of policy tools should equal the number of policy targets.

Second, the SRS stimulates the development of the interbank money market (the broader the interest rate corridor, the more room there is for interbank transactions). The ARS makes the interbank market redundant (Schnabel, 2023; Borio, 2023) because it is easier and less risky for commercial banks to put surplus liquidity on a CB deposit account than to lend it to other banks. On the other hand, situations where commercial banks are short of liquidity are relatively rare (compared to the SRS).

Third, under the ARS, commercial banks may be more sluggish in their response to CB interest rate changes than under the SRS. This makes the monetary policy transmission mechanism less efficient. Borio (2023) argues that, in the SRS, commercial banks' demand for reserves is purely for settlement purposes, so the CB policy rate plays an important signalling role. In the ARS, commercial banks consider CB reserves as the store of value, and the market signalling role disappears. Borio (2023) also points to the possibility of a "leaking floor", i.e. the market rate below the CB deposit rate. Such a situation indicates a disturbance in the monetary policy transmission mechanism.

Fourth, the ARS makes commercial banks less interested in bringing deposits as they rely on excess liquidity, which leads to higher spreads between commercial banks' lending and deposit rates. As a result, it creates a political temptation to tax commercial banks' "windfall" profit generated by higher spreads, a phenomenon broadly observed in contemporary Europe. Such taxation has, of course, a distortive impact on financial intermediation. Besides, higher spreads mean a less effective monetary transmission mechanism (see above).

Finally, to effectively execute its price stability mandate, a CB must sterilise excess liquidity. Regardless of the instrument used (reverse repo, deposit facility, CB bonds), this involves costs and may be detrimental to the CB's financial result (profit or loss). Of course, this result depends on the effective interest rate paid by the CB for its deposits/reverse repo operations/yields on issued bonds vs. income generated by its assets. They may change depending on the financial market situation and sentiments. When commercial banks' demand for base money is high, and they are ready to keep high deposits in the CB unremunerated or even for negative interest rate (the case of the ECB between 2014 and 2022, the SNB between 2015 and 2022, and the Bank of Japan (BoJ) between 2016 and 2023), it is a "profitable" business for the CB. However, when demand for base money decreases, the CB must offer sufficiently high interest to bring in commercial bank deposits.

2.5. The potential impact of the CB operational system on its independence

Under certain circumstances, the ARS can question the CB's reputation and independence.

Subsection 2.4 described one such situation: costly sterilisation of excess reserves, leading to CB financial losses. The political community and broad public opinion can have problems understanding the arcane world of CB balance sheets and financial accounts, leading to a negative attitude towards a loss-making CB. Remember that high sterilisation costs are not the only potential reason for a CB's financial losses. It may also be the valuation effect of sizeable foreign exchange reserves when domestic currency appreciates. Much depends on the CB's specific accounting standards and formal interlinks between the CB's financial accounts and the state budget.

Borio (2023) also suggests that the ARS can create a perception of the CB subsidising commercial banks, with all the negative political implications.

However, the biggest challenge to the CBs' independence comes from their large balance sheets, especially if these have been the product of QE. The length and size of QE in AEs after the GFC and during the COVID-19 pandemic unavoidably led to the domination of government bonds in CB assets (due to a limited supply of other high-quality liquid assets – see Dabrowski, 2022; 2023). Even if motivated by monetary policy considerations, the CBs in AEs have become *de facto* large net creditors to governments (see Subsection 4.2) and hostages to fiscal policies. Their room for manoeuvre in monetary policy tightening has been significantly narrowed (Dabrowski, 2023). Ironically, the structure of their balance sheets is similar to that of CBs in EMEs in the last quarter of the 20th century. We will return to this matter in Section 4.

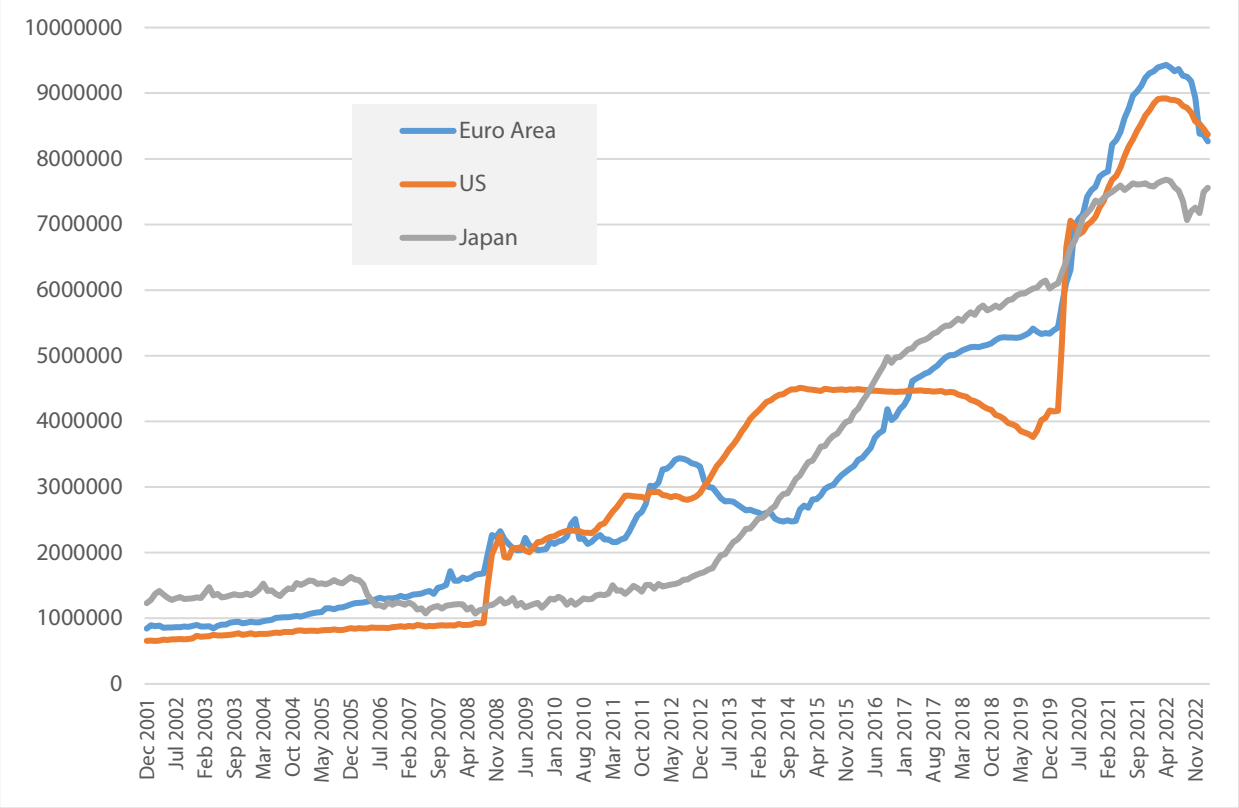
3. EXCESS LIQUIDITY IN THE EURO AREA

This section presents the history of the accumulation of excess liquidity in the euro area after the GFC of 2007–2009, the European financial crisis (EFC) of 2010–2015, and during the COVID-19 pandemic (2020–2022) followed by recent attempts (since 2022) to reduce the ECB's balance sheet. It is divided into three subsections. First, we present the Eurosystem's balance sheet expansion since the GFC (Subsection 3.1). This is followed by an analysis of the excess liquidity (Subsection 3.2) and the transition from the SRS to ARS (Subsection 3.3), both being the consequence of UMPMs, primarily QE. For comparison, we also analyse similar developments in the Fed and BoJ.

3.1. Expansion of the ECB balance sheet

Before the GFC, the Eurosystem's balance sheet represented a modest size (Figure 3), compatible with a structural liquidity deficit in the euro area's banking sector and SRS. A similar situation was observed in most AE CBs.

Figure 3: Central bank assets, euro area in EUR million, United States in USD million, Japan in JPY hundred million, December 2001 – February 2023



Source: IMF International Financial Statistics, and author's own elaboration.

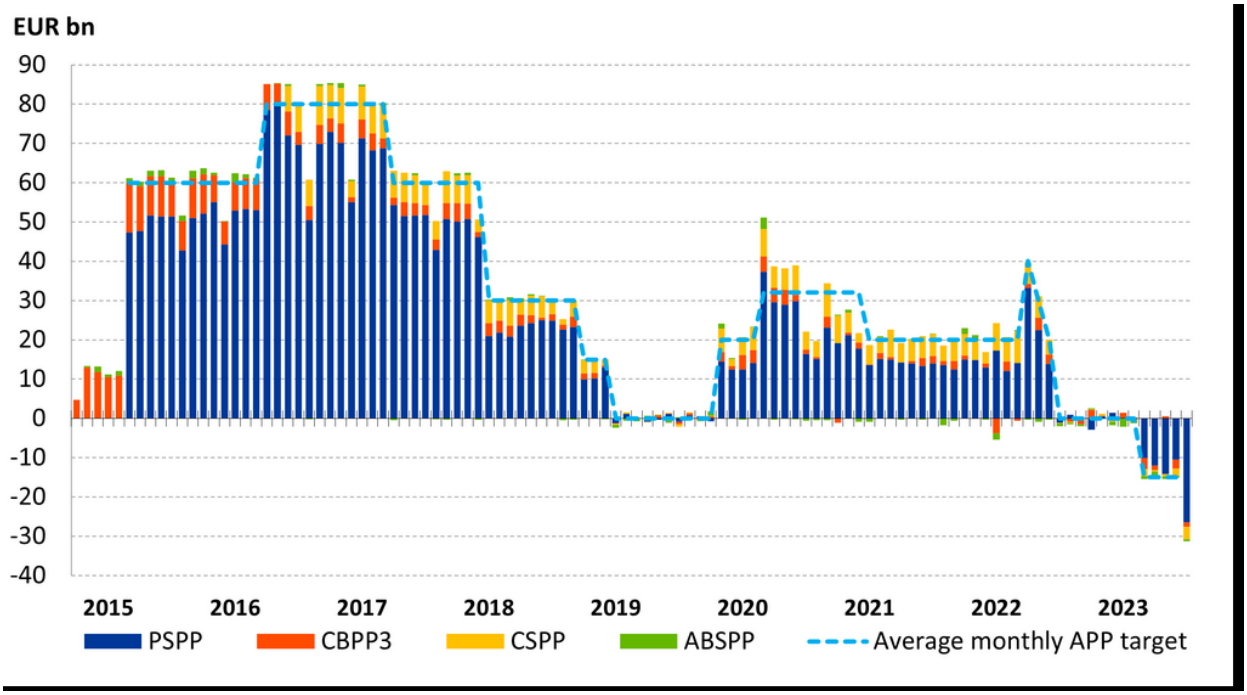
The situation started to change with the full-blown outbreak of the GFC in September 2008, following the Lehman Brothers' bankruptcy. After cutting interest rates to a near-zero level and facing the necessity of continuing monetary expansion, CBs in AEs applied unconventional monetary policy measures (UMPMs) (Joyce et al., 2012). The Fed was the first to launch QE in Q4 2008 (D'Amico et al., 2012). The Bank of England (BoE) was next, starting QE in March 2009 (Joyce and Tong, 2012). The BoJ, which experimented with QE in 2001–2006, returned to this policy tool on a low scale in October 2010 but significantly intensified it from April 2013. The adoption of QE led to a rapid increase in CB assets, as seen in Figure 3.

The SNB did not resort to purchasing long-term assets. However, as mentioned in Subsection 2.2, it expanded its balance sheet by several rounds of interventions in the foreign exchange market to prevent further CHF appreciation. It also provided additional liquidity to commercial banks (Christensen and Krogstrup, 2015).

Like the SNB, the Eurosystem expanded its balance sheet primarily by providing additional liquidity to the banking sector. This was done, among others, by extending maturities and easing collateral requirements of the ECB lending programmes (Constancio, 2018; Hartmann and Smets, 2018). On the other hand, the Securities Market Programme (SMP) provided for the crisis-affected countries of the euro area periphery was an APP-type instrument applied between 2010 and 2012. However, the monetary effects of this policy tool were fully sterilised. The SMP's successor, the Outright Monetary Transactions (OMT) programme, was never activated.

Despite the marginal use of APP-type instruments, the Eurosystem's assets more than doubled between August 2008 and July 2012 (Figure 3). However, between July 2012 and August 2014, they shrank by almost 30%.

Figure 4: The ECB's APP, net monthly purchases in EUR billion, 2015–2023



Source: European Central Bank – see https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html#pspp.

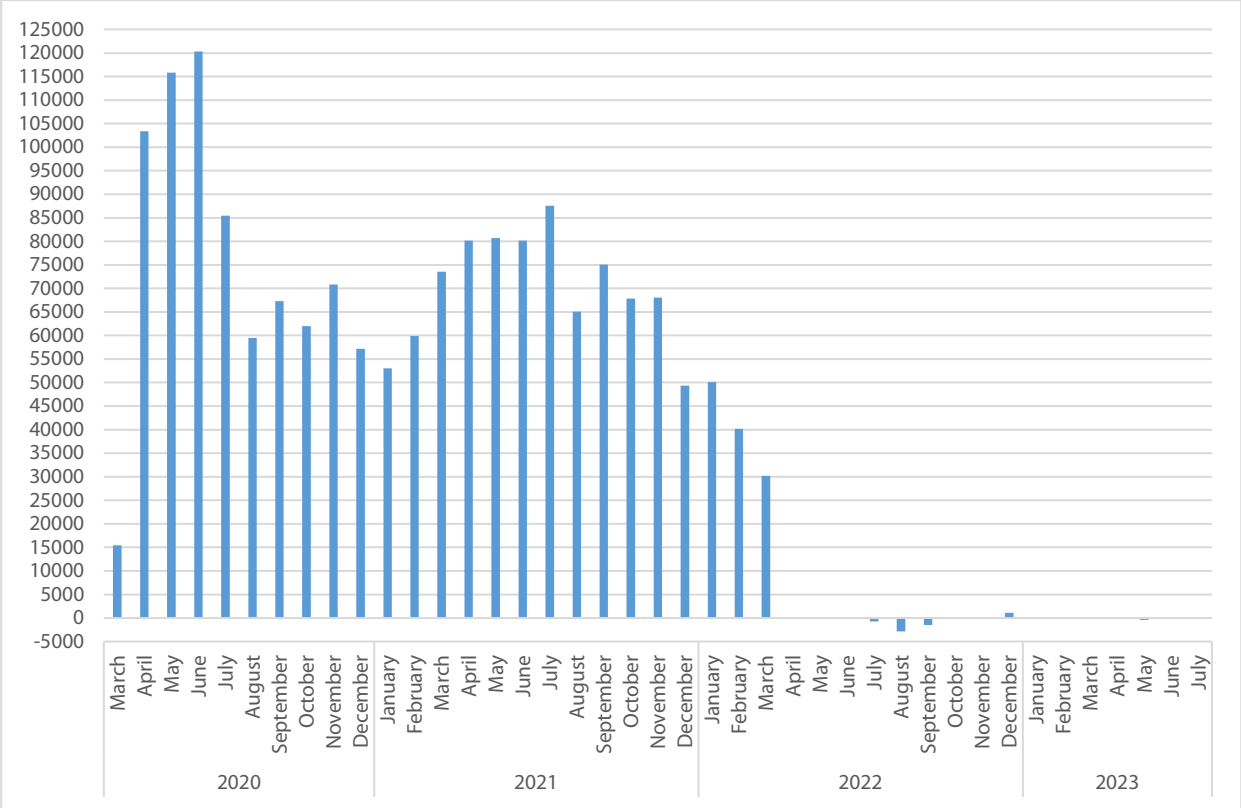
Notes: PSPP – public sector purchase programme, CBPP3 – third covered bond purchase programme, CSPP – corporate sector purchase programme, ABSPP – asset-backed securities purchase programme.

The turning point came in October 2014, when the ECB's Governing Council decided to launch a large-scale APP. Avoiding the risk of deflation served as the primary justification for this decision (Constancio, 2018). The highest intensity of net purchases was recorded between March 2015 and December 2017. In 2018, the pace of monthly purchases decelerated and stopped entirely in the first ten months of 2019 (Figure 4). The APP was resumed in November 2019, to be intensified in March and April 2020 after the outbreak of the COVID-19 pandemic.

The outbreak of COVID-19 triggered a new wave of monetary policy easing in the euro area (similar to other currency areas). Apart from the continuation and intensification of the standard APP, the ECB launched the Pandemic Emergency Purchase Programme (PEPP) (Figure 5), which resulted in the total

purchase of an additional EUR 1,700 billion assets in 2020-2022[28], primarily government securities. The highest monthly net purchases were recorded between April and July 2020 and March and September 2021.

Figure 5: The ECB's PEPP, net monthly purchases in EUR million, March 2020–July 2023.



Source: ECB https://www.ecb.europa.eu/mopo/pdf/PEPP_purchase_history.csv?b403919ca5d9c7f5c08e9a7ee1a549af.

As a result of the APP and PEPP, the Eurosystem's assets almost quadrupled between August 2014 and April 2022, when they reached their maximum. Since then, there has been a slow trend of decreasing Eurosystem assets. Between April 2022 and February 2023, they fell by 12.4%.

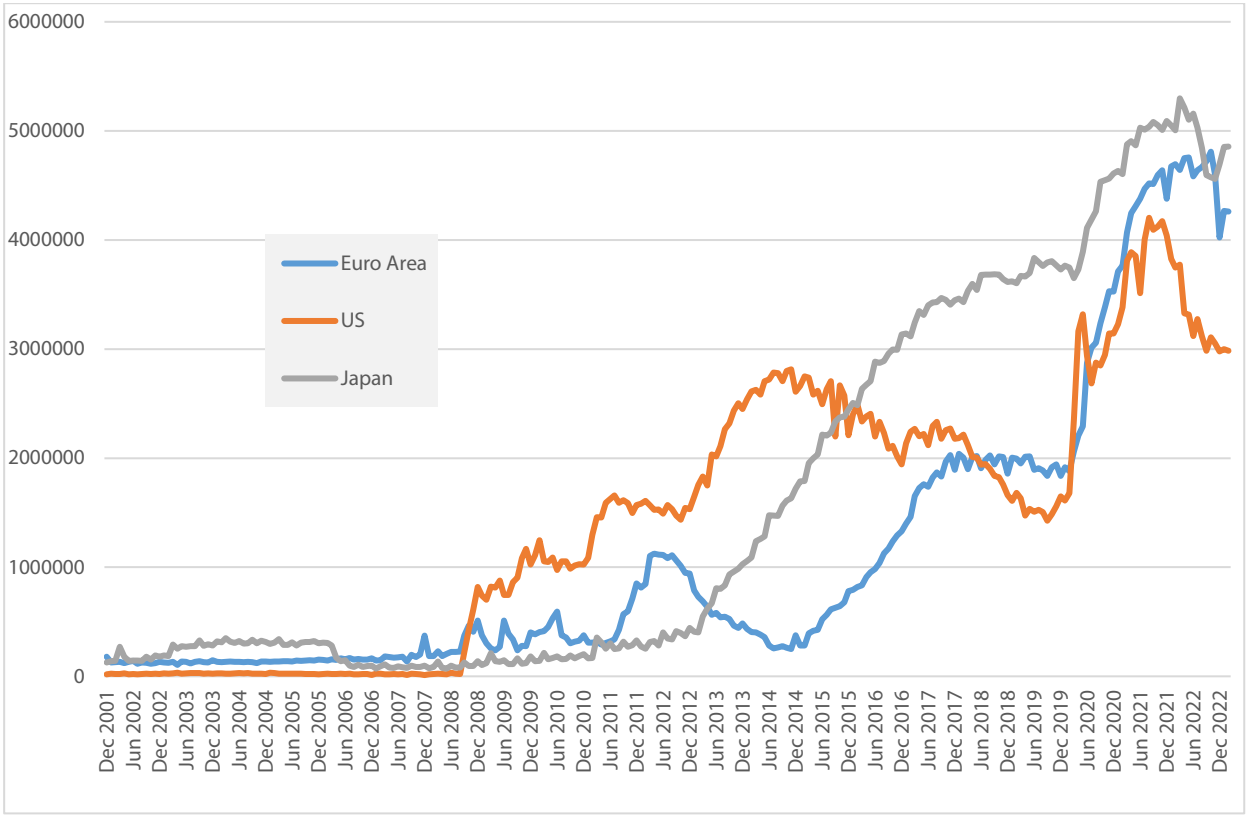
Figure 3 shows the similarity between the ECB and two other large CBs (Fed and BoJ) in terms of the growth of their assets after the GFC. However, there are striking differences in timing, particularly between the ECB and the Fed. The ECB launched its full-scale QE at the turn of 2014 and 2015 when the Fed stabilised its balance sheet and was about to start modest QT. Unlike the Fed, the Eurosystem did not reduce its assets in the inter-crisis period in the second half of the 2010s. In the post-COVID-19 period, it started tightening monetary policy, including reducing its balance sheet. However, this reduction has been slower than in the Fed (see Subsection 4.4).

3.2. Large balance sheets and excess liquidity

Figure 6 shows the dynamics of CB liabilities to other depository corporations (commercial banks), that is, a measure of excess liquidity in a narrow, operational sense (see Subsection 2.1).

[28] See https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html.

Figure 6: CB liabilities to other depository corporations, euro area in EUR million, United States in USD million, Japan in JPY hundred million, December 2001–February 2023



Source: IMF International Financial Statistics, and author's own elaboration.

By comparing Figure 6 with Figure 3, one can conclude that the size of commercial bank deposits in the CBs in the three analysed economies (the euro area, the United States, and Japan) followed the changes in CB assets. Before the GFC, they were recorded at the BoJ, which resorted to QE in the early 2000s (see Subsection 3.1). They were virtually non-existent at the Fed and minimal (but increasing) in the ECB. The situation has changed radically since the GFC, with the adoption of UMPMs, particularly QE. The size of CBs' liabilities to other depository corporations grew rapidly. However, these liabilities fell when CBs reduced their balance sheets (the ECB between 2012 and 2014, the Fed between 2014 and 2019, and all three CBs in 2022-2023).

The above observation triggers two interesting questions. The first concerns commercial banks' behaviour. Why were they ready to deposit such large amounts of money in CB accounts, especially at negative interest rates, as in the case of the ECB and BoJ[29]? Why did they not invest surplus resources in commercial lending or purchasing government and commercial papers? Due to the absence of comprehensive empirical research on this phenomenon, we will limit ourselves to just a few hypotheses.

First, new banking and financial sector regulations introduced after the GFC (the so-called Basel 3 rules), with notably higher LCRs[30], forced commercial banks and other financial institutions to hold more high-quality liquid assets (HQLA) than before the GFC (Cecchetti and Schoenholtz, 2019). Second, given the fresh memory of the GFC, commercial banks might have preferred to keep higher liquidity buffers

[29] The situation in the United States was different: since the GFC, the Fed intoduced a positive interest rate for commercial banks' excess reserves, which were unrenumerated before 2008 (see Cecchetti and Schoenholtz, 2019).

[30] See https://www.bis.org/publ/bcbs238.htm

(above those determined by LCRs and other banking regulations) to meet unexpected deposit withdrawals, cushion the negative consequences of non-performing loans (NPLs), and for other instances of financial instability (Berrospide, 2012). Third, the reduced role of the interbank market after the GFC forced banks to rely on their liquid resources deposited in CBs.[31] Interestingly, one can detect a sort of vicious circle here. The increased CB liquidity and ARS were supposed to take the role of the short-term interbank market heavily damaged during the GFC. However, as long as the ARS exists, commercial banks are not incentivised to rebuild an interbank market. Fourth, declining growth rates in AEs (Dabrowski, 2023) diminish the number and size of profitable and not excessively risky lending projects that commercial banks can finance. However, negative interest rates on commercial banks' deposits in CBs seemed to have a stimulating effect on their lending activity, other things being equal. At least such a development was observed in the euro area (Demiralp et al., 2019; Claeys, 2021).

The second question relates to the monetary policy effects of QE and the effectiveness of this policy instrument. Continuation of monetary expansion when CB interest rates had already reached a zero or near-zero level was the primary justification of QE. CBs assumed that the newly created base money would be absorbed by commercial banks and transformed into broad money aggregates, contributing to higher aggregate demand. However, when commercial banks deposited most of this newly created base money into CB accounts, this policy goal was only partly accomplished. The growth of broad money aggregates (M2 and M3) remained modest, and the money multiplier declined rapidly (Dabrowski, 2023).

On the other hand, the self-defeating mechanism of QE protected the economy against the inflationary consequences of a rapid increase in base money, at least until a certain point. If commercial banks and the real sector had absorbed the newly created base money faster, higher inflation would have come earlier than in 2021–2022.

One may ask why the QE was continued for so long despite its limited effectiveness for monetary expansion. One answer relates to the widespread belief that monetary aggregates, especially base money, do not matter in the contemporary economy[32]. Instead, policy focused on flattening the yield curve, i.e. decreasing long-term interest rates (Belz and Wessel, 2020). Another explanation may relate to the fiscal consequences of QE. Because purchases of government bonds dominated APPs, public debt service costs fell (Dabrowski, 2022). In other words, large-scale QE was, in fact, of a quasi-fiscal character, even if motivated by monetary policy considerations.

3.3. Excess liquidity and moving from the SRS to ARS

As discussed in Subsection 2.3, the rapid increase in CB assets and building up structural liquidity surplus had to impact the operational conditions of monetary policy. Continuation of the SRS (a "corridor" system) was no longer possible, and CBs had to move to the ARS (a "floor" system). In the Fed, it happened immediately after the GFC outbreak and the launching of QE in Q4 2008 (Mulligan, 2021). The effective FFR was quite often below the "floor", i.e. interest on reserve balances (IORB), which could suggest the "leaking floor" phenomenon (Borio, 2023; see also Subsection 2.4). In 2019, the Fed declared the continuation of the ARS[33] because excess liquidity did not allow returning to SRS despite the QT conducted between 2015 and 2019.

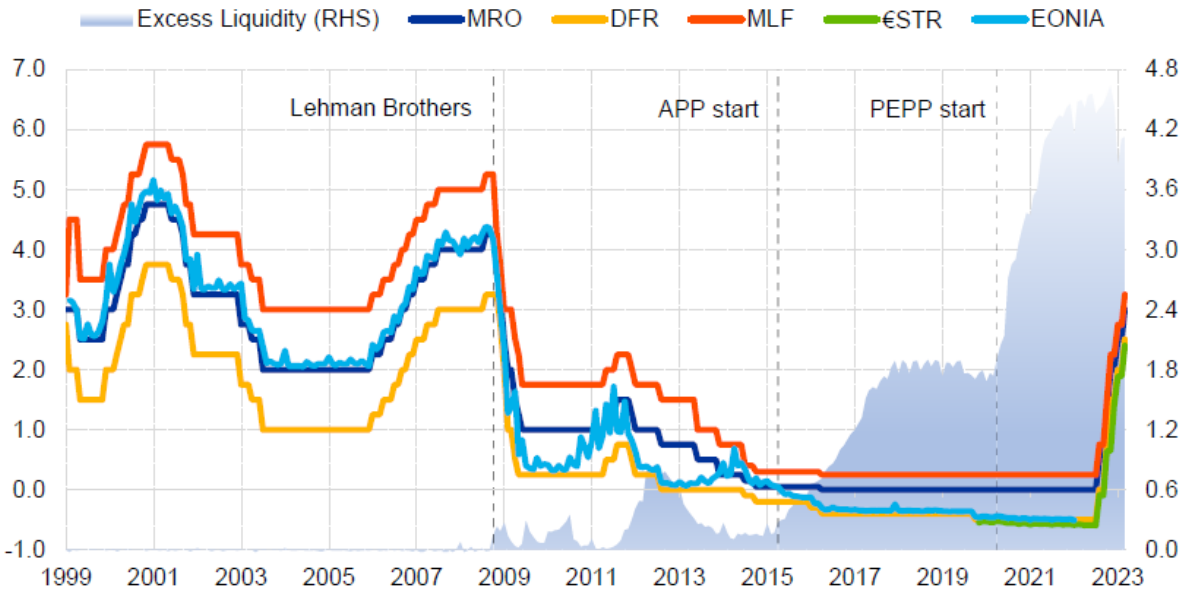
[31] The same concerned liquidity storage needs of non-banking financial institutions satisfied via commercial banks.

[32] See e.g. the presentation of Lucrezia Reichlin during the Monetary Dialogue Preparatory Meeting at the Committee on Economic and Monetary Affairs of the European Parliament on 15 March 2021 - https://multimedia.europarl.europa.eu/en/econ-monetary-dialogue-preparatory-meeting-live-later-due-to-technical-problems_20210315-1430-COMMITTEE-ECON_vd

[33] https://www.federalreserve.gov/monetarypolicy/2019-02-mpr-part2.htm

At the ECB, moving to the ARS coincided with periods of rapid growth in its balance sheet and the emergence of excess liquidity, i.e. voluntary deposits by commercial banks (Figure 7). However, the transition to the ARS was completed by launching large-scale APPs in 2015 (Schnabel, 2023).

Figure 7: ECB key policy rates, overnight market rates (LHS: in %) and excess liquidity (RHS: in EUR trillion), 1999–2023



Source: Schnabel (2023).

Notes: EONIA – Euro Overnight Index Average; €STR – the euro short-term rate; MRO – Main Refinancing Operation (rate); MLF – Marginal Lending Facility (rate); DFR – Deposit Facility Rate.

The CB balance sheets and excess liquidity reduction policies in 2022–2023 have been too limited to enable a return to the SRS. That would require more radical policy actions, which will be discussed in Subsection 4.1.

4. MOVING BACK FROM THE ARS TO SRS, AND QUANTITATIVE TIGHTENING

In this section, we will discuss the perspective of reducing excess liquidity and returning to the SRS in the context of the ongoing monetary policy tightening in major currency areas and attempts to reduce CB balance sheets (QT). To begin with (Subsection 4.1), we analyse whether QT is necessary for a return to the SRS. In Subsection 4.2, we discuss other (monetary policy-related) arguments favouring QT. Subsection 4.3 is devoted to financial stability risks associated with QT and preventive measures that can mitigate these risks. Subsection 4.4 analyses the pace and instruments of QT undertaken by three major CBs and assesses their effectiveness.

4.1. Is QT a necessary condition for returning to the SRS?

In Subsections 2.4 and 2.5, we presented the advantages of the SRS (a "corridor" system) over the ARS (a "floor" system). They indicate that moving back to the SRS from the ARS, which now dominates the CB operational frameworks of monetary policy, would help improve monetary policy's transmission mechanism, restore the short-term interbank market, and enhance the perception of CB economic independence. Given the record-high CB balance sheets and excess liquidity, one could ask whether this is possible without their substantial reduction, i.e. large-scale QT.

Looking at CB liabilities (Figure 1), there is one hypothetical option for reducing excess short-term liquidity without a radical downsizing of CB balance sheets: a maturity conversion of a substantial part of CB liabilities. They are currently of a predominantly short-term character, for example, overnight deposits of commercial banks in the CB or reverse repo operations with a short maturity. If the current voluntary overnight deposits of commercial banks in the CB could be converted into long-term deposits or CB bonds with long-term maturity, it would enable a return to structural liquidity deficit in the banking systems and restore the SRS, in which the CB would satisfy the current liquidity needs of commercial banks via short-term repo operations, refinancing credit, and other liquidity supply tools (see Borio, 2023).

However, such a hypothetical model has some potential shortcomings. First, during the decade and a half since the GFC, commercial banks have become addicted to excess liquidity and the ARS. They might not be interested in parking a substantial part of this liquidity in CB accounts for the long term. Second, the cost of such a parking operation (CB bond yields or interest rate on long-term deposits) could be high for the CB, exceeding potential revenue from repo operations or refinancing lending and yields on government bonds held in the CB portfolio. Third, the CB would have to use several monetary policy instruments (short-term rates, interest rates/CB bond yields for its long-term liabilities, and determination of the size of its balance sheet) simultaneously. As mentioned earlier (see Subsection 2.4), that would contradict the Tinbergen rule and decrease monetary policy transparency.

Given the above shortcomings, it is challenging to recommend the large-scale maturity conversion of CB liabilities as the main avenue of restoring the SRS. Instead, such a conversion could be considered a supplementary and temporary tool accompanying the QT, which would play a decisive role.

Increasing minimum (mandatory) reserve requirements, especially when either unremunerated or remunerated below the market rate, is a less costly way to reduce excess liquidity than offering long-term deposits in CB or CB bonds. However, there are limits to using this instrument, which plays the role of an implicit tax on commercial bank deposits.

4.2. Other arguments in favour of QT

The QT is also important for speeding up the disinflation process and making it sustainable. Restoring price stability in an environment of large CB sheets and the resulting overhang of base money and short-term liquidity will be difficult. Commercial banks' high demand for base money, which prevailed in the 2010s and which mitigated the potential inflationary impact of this overhang (see Subsection 3.2), was, to a certain extent, of a one-off nature (legacies of the GFC and EFC, adaptation to Basel 3 regulatory standards), and will not necessarily continue in the future. Furthermore, a new round of QE during the COVID-19 crisis went beyond the actual demand for base money, which was reflected in the inflation surge in 2021–2023 in almost all AEs. A gradual increase in short-term CB lending and deposit rates may not prevent excess liquidity from "leaking" into the banking sector and economy. The relatively slow disinflation process in AEs suggests that additional policy actions are needed to accelerate it. QT could play an essential role by increasing long-term interest rates and draining excess liquidity.

Ideally, monetary policy tightening should start with shrinking CB balance sheets (QT) as the primary disinflation instrument, followed by a hike in short-term policy rates. Regretfully, CBs chose a different sequence of monetary tightening. First, they started raising short-term interest rates and only then began to downsize their balance sheets. Worse, the pace of QT has been relatively slow so far (see Figure 3 and Subsection 4.4).

Large liquidity "overhang" creates the risk of its unexpected rapid absorption by the banking system and real economy when their demand for base money suddenly decreases (money velocity increases), leading to inflationary consequences. Furthermore, as argued in Subsection 2.4, the monetary policy transmission mechanism works slower and less effectively in excess liquidity.

Therefore, unless the pace of QT is accelerated, the disinflation in leading currency areas may become a long and economically painful process (due to the building up of inflationary inertia).

Apart from inflation-related concerns, there are also other arguments in favour of QT. They relate to legal aspects of the functioning of CBs (Whelan, 2023). Most CB statutes prohibit the monetary financing of fiscal deficits. This ban is firm in the case of the ECB. Article 123 of the Treaty on the Functioning of the European Union (TFEU) states the following:

> "*Overdraft facilities or any other type of credit facility with the European Central Bank or with the central banks of the Member States (hereinafter referred to as "national central banks") in favour of Union institutions, bodies, offices or agencies, central governments, regional, local or other public authorities, other bodies governed by public law, or public undertakings of Member States shall be prohibited, as shall the purchase directly from them by the European Central Bank or national central banks of debt instruments.*"

While Article 123 has been interpreted as a ban on the direct purchase of government bonds on the primary market, bond purchases on the secondary market as part of the QE and the resulting accumulation of a large stock of government bonds in the Eurosystem's portfolio led to legal challenges. The ECB had to defend its APPs in two cases before the Court of Justice of the European Union (CJEU). Although the CJEU rulings did not question the ECB's policies, legal doubts remained (Whelan, 2023). In this context, QT can help diminish the perception of the ECB's (and other CBs') fiscal dependence. We will return to this question in Subsection 4.3.

4.3. Financial instability risks associated with QT

Monetary policy tightening always involves the risk of financial instability because the debt service costs of commercial banks, other financial institutions, non-financial corporations, households and governments increase accordingly. It is even more challenging after a long period of ultra-loose monetary policy, as during the current tightening cycle. The reason is simple: Debtors become addicted to inexpensive borrowing and excess liquidity (Hussman, 2023).

Interestingly, the tightening "shock" is an overlooked aspect of macroeconomic fine-tuned asymmetry. Another relates to political economy considerations. For both reasons, policy easing is more politically affordable and less risky regarding undesired side effects (at least in a short time) than its reversal (policy tightening).

Besides, a complete policy cycle (easing followed by tightening) cannot always be symmetrical because the situation in the regulated sphere has changed. This is evident in the case of the ongoing QT (Schnabel, 2023): it will not bring CB assets down to the pre-GFC level because the demand for base money has increased significantly since then.

In the current situation, tightening monetary policy – and particularly intensifying QT – could create challenges for two sectors: the financial sector (commercial banks) and the government.

The risks for commercial banks and other financial institutions can have a variety of origins. First, all assets (banks' loans extended to their clients, bonds and others) accumulated during ultra-loose monetary policy must be reassessed regarding market price and riskiness when market interest rates increase. Second, the profitability of banks' clients can decline in tighter macroeconomic conditions (lower aggregate demand), and their ability to repay loans will diminish. This can increase NPLs and deteriorate the quality of banks' assets. Third, refinancing bank liabilities will become more expensive, and their access to short-term liquidity will be more restricted. The money market tensions in mid-September 2019 (Anbil et al., 2020) and the Silicon Valley Bank (SVB) failure in March 2023 (Merler, 2023) are good examples of the materialisation of such risks.

The risk to government finances comes from excessive public debt, which reached a record-high peacetime level (Dabrowski, 2022). Monetary tightening, either by hiking short-term CB interest rate, QT, or both, increases interest payments, i.e. debt servicing costs. On the other hand, high inflation depreciates the real value of debt stock. However, the higher inflation and negative real interest rates in 2021–2023 have not yet reduced the public debt-to-GDP ratio in most AEs. There are at least two reasons for this: continuous large primary deficits and slow GDP growth or stagnation.

The vulnerability of government finances spreads to commercial banks, which hold a substantial portion of public debt. Furthermore, in many jurisdictions, financial regulations treat government bonds as HQLAs, collateral for CB loans and riskless assets. Therefore, fear concerning government solvency can immediately spill over to the banking sector and cause a systemic banking crisis. Such a development was observed, for example, during the EFC in the first half of the 2010s, particularly in Greece.

Hence, fiscal adjustment (elimination of budgetary deficits and reduction of public debt-to-GDP ratios) should be the primary antidote for mitigating the risk of financial instability during the implementation of QT and, more generally, monetary policy tightening. It would protect government finances and, indirectly, the financial sector against potential turbulence from higher debt servicing costs. Another measure should involve further strengthening banking supervision and updating its tools to the reality of contemporary digital banking (Merler, 2023) and banks' increased exposure to government bonds.

In particular, the stress tests should adopt more realistic and cautious assumptions regarding sovereign insolvency risks.

Many authors (e.g. Schnabel, 2023; Whelan, 2023) advocate a gradual implementation of QT as the primary safeguard against financial instability. Such a recommendation sounds reasonable but with two caveats.

First, a gradual approach does not always prevent crisis development, as demonstrated by the abovementioned episodes of instability in September 2019 and March 2023. This is because economic agents who need stronger signals to adjust their behaviour overlook the slow pace of policy or regime change. The second is the slow pace of QT, which may prove insufficient for quickly bringing annual inflation down to 2% and reducing the excess liquidity to an extent that would allow a return to the SRS in the foreseeable future (see Subsection 4.4).

4.4. Actual pace and instruments of QT

Figure 3 shows that the three largest CBs in AEs started reducing their balance sheets in Q2 2022. This was first done by discontinuing specific emergency lending programmes of the COVID-19 era and their repayment by borrowers. In the case of the ECB, it was the repayment of outstanding longer-term refinancing operations (TLTROs) loans by commercial banks (Schnabel, 2023).

On 4 May 2022, the Fed announced a plan to reduce its balance sheet via outright QT[34]. Starting in June 2022, it was USD 47.5 billion per month for the first three months, doubling to USD 95 billion per month. The Fed's balance sheet reduction was temporarily reversed after the SVB crisis in March 2023 (due to short-term emergency lending) but returned to the previous pace after approximately two weeks.

The ECB announced a plan to reduce the Eurosystem's security holdings nine months later, on 2 February 2023[35]. Its implementation started in March 2023. However, the pace of this reduction has been relatively slow, at EUR 15 billion per month until June 2023, accelerated to EUR 27 billion per month on average for the next 12 months.[36] Interestingly, the QT affected the "old" APP, while the PEPP asset holdings will be fully reinvested by 2024.

The BoJ is at the stage of a comprehensive review of its previous policies (Guo and Zhu, 2023). It will implement its yield curve control (YCC) strategy with greater flexibility, especially at the long-term end of the yield curve. Although it is continuing its policy of monetary easing, it also intends to return corporate bond stock to the pre-pandemic (lower) level[37].

With the current pace of QT, returning to the pre-pandemic size of CB balance sheets (at the end of February 2020), which may be taken as a reasonable policy goal, will take a long time. In the case of the Fed, with the monthly amount of QT equal to USD 95 billion, this goal could be accomplished by around October 2026. However, with an average monthly QT rate of EUR 27 billion, the ECB will require eight years.

This means that a substantial reduction of CB assets, which could facilitate a return to the SRS, is still a distant perspective, especially in the euro area, unless the pace of QT is radically accelerated. It can explain why most CBs do not raise the question of returning to the SRS yet or even explicitly declare continuation of the ARS, as in the case of the Bank of Canada (Gravelle et al., 2023).

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[34] See https://www.federalreserve.gov/newsevents/pressreleases/monetary20220504b.htm

[35] See https://www.ecb.europa.eu/press/pr/date/2023/html/ecb.pr230202~1a4ecbe398.en.html

[36] See https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html

[37] See https://www.boj.or.jp/en/mopo/mpmdeci/mpr_2023/k230728a.pdf

5. CONCLUSIONS

After more than a decade of ultra-loose monetary policy, UMPMs, including QE, contributed to the unprecedented expansion of CB balance sheets and radically changed the operational settings of CBs in AEs, bringing them, in many respects, close to the experience and policy dilemmas typical of CBs in EMEs. Due to the excess liquidity, the SRS, the dominant operational setting in AEs before the GFC, had to be replaced by the ARS. The single monetary policy tool (interest rate for short-term open market operations) was supplemented by longer-term interest rates charged under special lending facilities (such as the TLTRO in the ECB), and quantitative targets of asset purchases. The behaviour of commercial banks and non-banking economic agents adjusted to the new monetary environment.

As the SRS has several advantages over the ARS (see Subsection 2.4), returning to it would be a desirable policy goal. However, it requires a far-going reduction in CB assets and excess liquidity to be feasible. Such a reduction is also necessary to make the disinflation policy successful (quickly bringing down annual inflation to the targeted level of 2%).

Reducing CB securities holdings (QT) is the primary avenue for achieving the above policy goal. Other instruments, such as the termination of the special lending facilities created during the COVID-19 pandemic, can be helpful, especially in the initial stages of monetary tightening, but have limited potential. Similarly, converting a part of CBs' short-term liabilities into long-term ones could speed up the transition to the SRS but cannot entirely substitute QT.

Looking at the current pace of QT, a reduction in excess liquidity sufficient for enabling a return to the SRS looks like a distant perspective. The above is especially true in the case of the ECB, which started monetary tightening and QT later than the US Fed and moved slowly in this direction. Thus, unless the pace of QT is accelerated, the ECB will not be able to return to the SRS in the foreseeable future.

Every monetary tightening involves a risk of financial instability. In the current tightening cycle, this risk is magnified by a long period of near-zero interest rates, abundant liquidity, and a record-high level of public debt in AEs. The latter negatively affects the stability of government finances and indirectly affects commercial banks and non-banking financial institutions heavily exposed to government bonds. Therefore, a fiscal adjustment must be seen as the primary flanking measure, decreasing the risk of financial instability during monetary tightening.

Other measures should involve stricter financial supervision ready to address specific problems of contemporary (frequently digital) banking and reassess the role of government bonds as "safe" and highly liquid assets.

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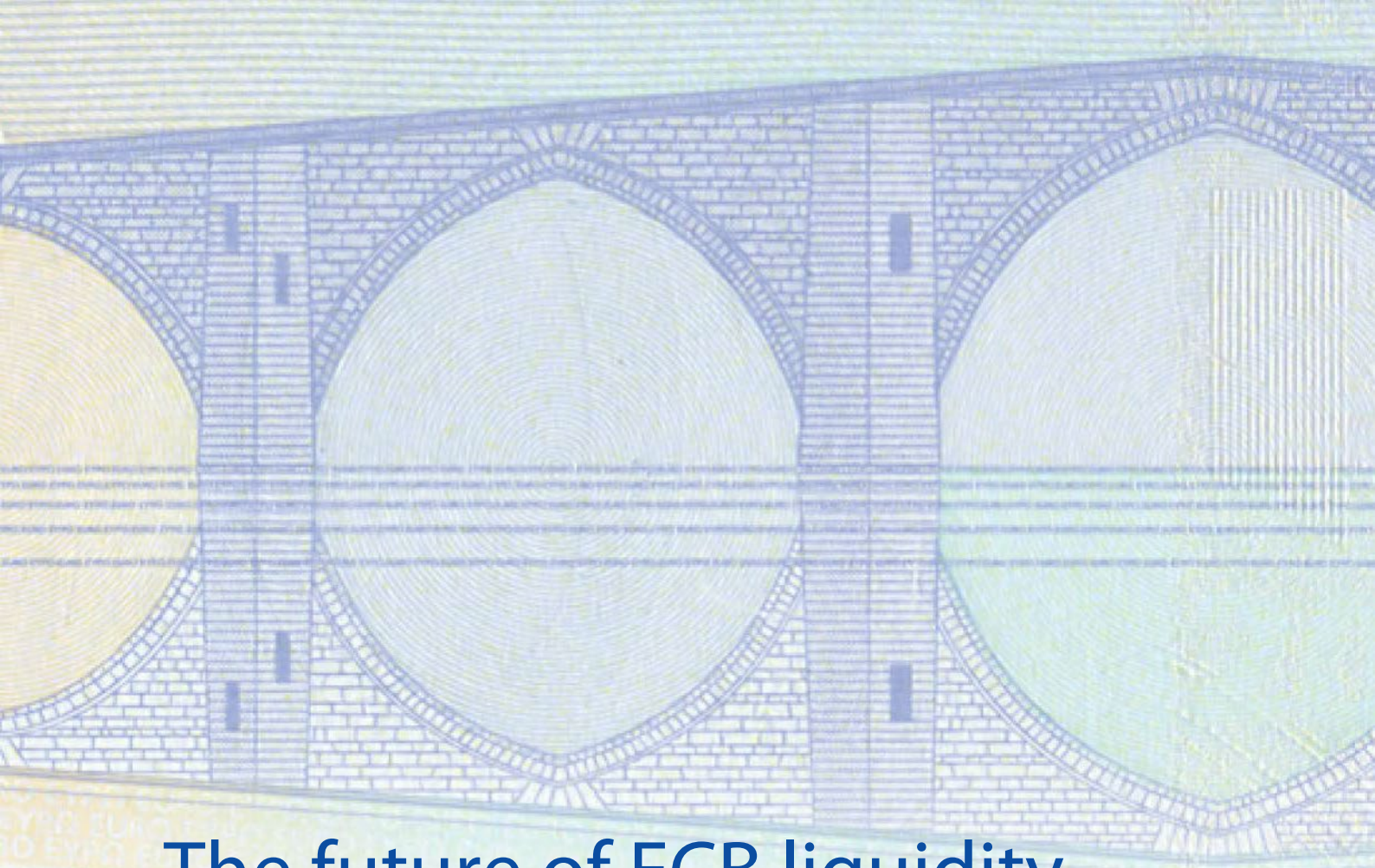

The future of ECB liquidity policy

Karl WHELAN

Abstract

The ECB is reducing its sovereign bond holdings and needs to consider the appropriate size of its balance sheet over the longer-term and the best operational framework for supplying liquidity to the banking system. This paper recommends the ECB substantially reduce its balance sheet but should maintain an ample reserves approach by keeping its full allotment policy for refinancing operations.

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CONTENTS

LIST OF ABBREVIATIONS

APP	Asset purchase programme
ECB	European Central Bank
EONIA	Euro OverNight Index Average
ESTER	Euro Short-Term Rate
LTRO	Longer-term refinancing operation
MRO	Main refinancing operation
ONRRP	Overnight Reverse Repurchase Program
TLTRO	Targeted longer-term refinancing operations
TPI	Transmission protection instrument
QE	Quantitative easing

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EXECUTIVE SUMMARY

- **The ECB has begun to reduce its balance sheet.** Thus far, the reduction is mainly due to TLTRO III loans being gradually repaid but the Eurosystem is also allowing its sovereign bond holdings to mature and not be replaced. A continuation of this pattern will see a reduction in the reserve balances held by commercial banks in the deposit facility.
- **The ECB faces longer-term decisions about how it should implement monetary policy.** Should it maintain a large supply of liquidity and continue using its current operational tools or should they transition to a smaller balance sheet?
- **Some economists argue for a return to the ECB's pre-2008 procedures of keeping the supply of reserve balances very tight.** This paper presents a number of arguments against a return to these procedures.
- **The Federal Reserve decided in 2019 that it would not return to its pre-crisis operational framework for monetary policy.** It plans to continue providing an "ample supply" of reserves and using administrative rates, such as the interest rate paid on reserves, to control market interest rates.
- **One reason for this policy is that, since the global financial crisis, the demand for reserve balances from banks is larger and more unpredictable.** This reflects regulatory changes and changes in risk management at banks.
- **The events in US financial markets in September 2019 show that demand for reserves from banks can be unpredictable.** They also show that failure to supply enough reserves to the banking system can lead to financial instability.
- **The ECB should substantially reduce its balance sheet in the coming years.** There are many reasons for this including the need to comply with the prohibition on monetary financing, the need for space to deploy the Transmission Protection Instrument (TPI) effectively and the desirability of reducing the political tensions associated with the fiscal implications of a large Eurosystem balance sheet.
- **However, the ECB should continue to operate an ample reserves environment.** Like the Fed, the ECB is likely to find it difficult to estimate the underlying demand for reserve balances from the banking system. There are also no good macroeconomic arguments for returning to its pre-2008 policy of auctioning off a fixed supply of liquidity each week.
- **The most efficient way for the ECB to operate an ample reserves environment is by continuing to provide liquidity in the form of fixed-rate full-allotment refinancing operations.** This approach does not require extensive (and perhaps fruitless) efforts to estimate the day-to-day demand for reserves from the banking system.

1. INTRODUCTION

The implementation of monetary policy has changed profoundly over the past fifteen years. The long period of low or negative interest rates saw all major central banks introduce quantitative easing (QE) programmes. These programmes hugely increased the size of central bank balance sheets and left commercial banks with much larger quantities of reserve balances than they had previously held. These high reserve balances have required the introduction of new monetary policy tools once the focus of policy moved to raising interest rates to control inflation. The principal new tool has been the payment of interest on reserves. This approach has been used successfully by all the major central banks to recently implement tighter monetary policy.

Beyond the current tightening cycle, central banks face longer-term decisions about whether they should maintain a large supply of liquidity and continue using their current operational tools or whether they should transition to a smaller balance sheet and change their operational approach. At the most extreme, some economists such as Angeloni (2023) and Borio (2023) argue for a return to the ECB's pre-2008 procedures of keeping the supply of reserve balances very tight.

This paper discusses some of the issues the ECB will need to consider when deciding its future operational framework for liquidity provision. The paper is organised as follows.

Section 2 describes how monetary policy works in an environment where reserve balances are scarce and why a different policy framework is required when quantitative easing programmes have created a supply of reserves greater than demanded by the banking system. The evolution of the ECB's approach to monetary policy and the changes over time in the supply of reserve balances in the Eurosystem are also discussed.

Section 3 presents some arguments in favour of central banks maintaining a relatively large supply of reserves to the banking system and specifically argues against the ECB going back to its pre-2008 operational procedures in which it "auctioned off" a fixed supply of liquidity each week.

Section 4 reviews some arguments for the Eurosystem substantially reducing its balance sheet from its current size, thus cutting back on the supply of liquidity to the banking system. While I support the ECB maintaining an ample supply of reserves, taken together these arguments make a strong case for the ECB to execute a significant reduction in the supply of reserve balances over the next few years.

Section 5 reviews options available to the ECB in implementing an ample reserves liquidity policy, stressing that the key difference between the future operational framework and the pre-2008 approach should be the retention of the fixed-rate full-allotment method for supplying liquidity to banks.

2. MONETARY POLICY AND LIQUIDITY PROVISION

We will start with a discussion of the overall relationship between monetary policy and the provision of liquidity and how this has changed in recent times.

All commercial banks are required to maintain so-called "reserve accounts" with their central bank—that this money is kept "in reserve" rather than loaned out or used to buy securities is the basis of the term "fractional-reserve banking". Banks need to keep money in these reserve accounts for three reasons.

First, to be able to continue supplying cash to their customers: When a commercial bank orders a supply of cash from the central bank to put in its ATM machines, this amount is deducted from its reserve account with the central bank. Without sufficient reserve balances, it cannot obtain cash.

Second, to satisfy regulatory requirements, such as minimum reserve requirements set by central banks and the Liquidity Coverage Ratio (LCR) introduced in the Basel 3 accord (which we will discuss in more detail below).

Third, to honour payments requests by customers. Commercial banks use their reserve accounts at central banks to settle payments with other banks via payments systems such as Fedwire and TARGET2. These payment-related demands, which stem from the activity of their depositors, can be unpredictable so some reserves need to be held for precautionary reasons.

Central banks can adjust the supply of reserves as follows. To increase the supply, central banks can make a loan to a bank, crediting that bank's reserve account with a push of button, thus creating money from nowhere. Alternatively, central banks can purchase a security via an "open market operation" and pay for it by crediting the reserve account of the commercial bank with whom the seller holds their deposit account, again with money being created from nowhere. If they wish to reduce the supply of reserves, central banks can reverse these processes, taking loan repayments from commercial banks or selling securities and thus retiring money that had previously been created.

Traditionally, central banks kept the supply of reserves relatively low. This meant there were often banks that were short of their desired level of reserves. A shortage could be addressed in one of two ways. Banks could borrow reserves from other commercial banks, usually via short-term "money market" transactions. The lending bank would be willing to engage in this transaction because it allowed them to earn interest on their excess reserves—until recent decades central banks did not pay interest on reserve account balances. Alternatively, banks could borrow reserves from the central bank.

Central banks have generally focused on controlling the average cost of borrowing money over short periods as their operational target for implementing monetary policy. In the Eurosystem, the ECB used the Euro OverNight Index Average (EONIA) as its measure of the average rate, before switching in 2019 to the Euro Short-Term Rate (ESTER), a measure based on a broader range of quotes that the ECB produces itself.

In the era where reserves were kept scarce, there were various ways to control short-term market interest rates. The Federal Reserve adjusted the supply of reserves daily via open market operations: Making the supply of reserves scarcer reduced the number of banks willing to loan reserves at the existing interest rate and thus the market interest rate would have to move upwards if it were to continue equating supply and demand for borrowed reserves.

In contrast, the ECB's approach prior to 2008 was to provide a fixed amount of liquidity to the banking system in the form of loans in its weekly "main refinancing operation" (MRO). The liquidity was "auctioned" off with banks having to make offers on the interest rate they were willing to borrow at

and those banks making the highest offers getting the loans. Interest rate policy was implemented by the ECB setting a "minimum bid interest rate" that would be accepted. In practice, the average interest rate on these loans did not vary much from the minimum bid rate and this rate acted as the baseline for interest rates set in money markets.

The ECB also had (and still has) two other "standing facilities" to influence market interest rates: A deposit facility that pays interest on reserve balances and a marginal lending facility that charges a higher rate than the MRO rate for emergency borrowing. These rates served to provide upper and lower bounds on interest rates, with this type of monetary policy framework being known as a "corridor" system: Banks would not borrow at interest rates above what was available from the marginal lending facility and would not lend money at interest rates below what was available from the deposit facility.

Figure 1 shows that prior to 2008, market interest rates (the red line) would sometimes have days when they would spike up or down but they generally tracked very well with the MRO interest rate (the green line) while always staying with the corridor set by the standing facilities.

In more recent years, the huge supply of reserves created by QE programmes has meant that market interest rates can no longer be adjusted by varying the scarcity of reserves and there was limited need for banks to borrow reserves from central banks or from money markets. The Federal Reserve switched its operational focus from daily interventions to adjust the supply of reserves to instead using the interest rate paid on reserves to be the key policy rate. Since banks can earn this interest rate without taking on any credit risk, this interest rate acts as a lower bound for the interest rates that banks will charge for credit.

The ECB's operational approach also changed during the global financial crisis. Instead of providing a fixed amount of liquidity each week, the ECB changed in 2008 to a "fixed rate full allotment" system in which banks could borrow as much as they requested, subject to having a sufficient supply of eligible collateral. The Eurosystem also began supplying more liquidity to the banking system in the form of Longer-Term Refinancing Operations (LTROs) and then later expanded the supply of reserves via its asset purchase programmes.

Figure 2 shows how the euro area monetary base (currency plus commercial bank reserves with the Eurosystem) has fluctuated over time depending on the amount of lending from the Eurosystem and its holdings of securities. The recent reduction in the supply of reserves has been driven by banks repaying their TLTRO III loans from the Eurosystem after the ECB changed the terms of these loans to be less attractive. As of yet, there has been only a small reduction in the Eurosystem's holdings of securities. The reduction is occurring via allowing bonds to mature, rather than via outright sales (since July 2023 the Eurosystem has ceased reinvesting the proceeds of maturing bonds) but the impact on the supply of reserves is essentially the same. Generally, governments need to borrow the money to pay off maturing bonds, thus "rolling over" the debt. The person that purchases this new bond will order their bank to provide money to the government and this will see reserves transferred out of the banking system and into the government's account.

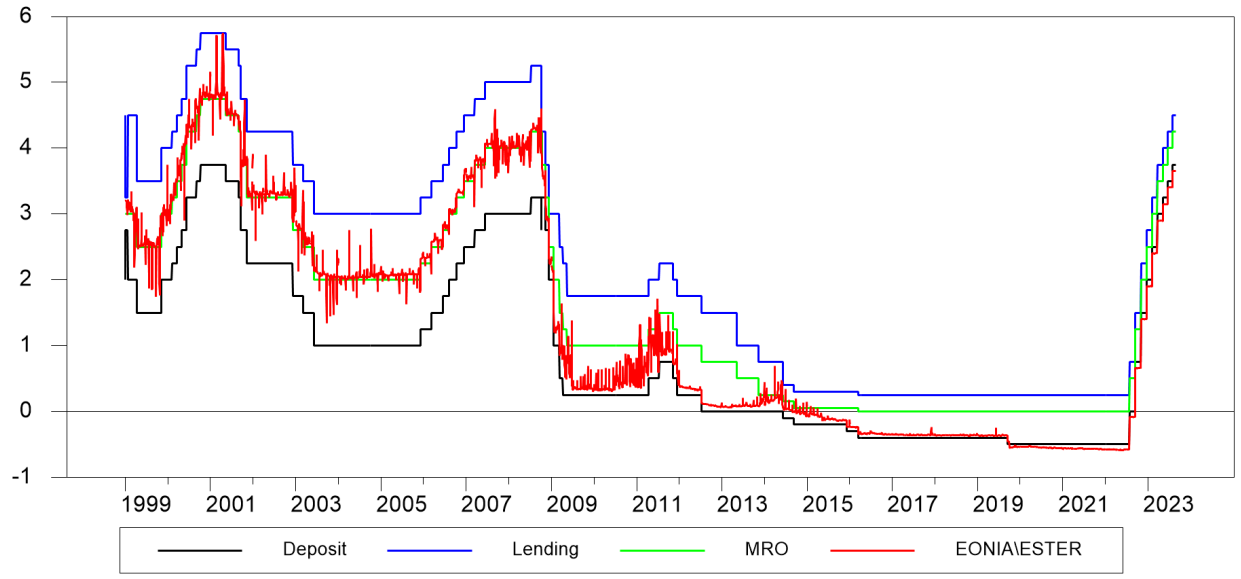
The large supply of reserves over the past decade has meant there was generally very little demand for borrowing reserves from the Eurosystem via the weekly refinancing operations and the rate charged in this operation became less relevant. Thus, as in the US, the key rate influencing market rates has been the interest rate paid from the deposit facility: Figure 1 shows how EONIA/ESTER (the red line) has closely followed the deposit facility rate (the black line) in recent years, rather than the MRO rate (the green line).

Because market rates have followed the deposit facility rate in recent years, central bank operational systems under ample reserves are sometimes called "floor" systems rather than a "corridor" system. However, there are two slightly misleading aspects of this terminology.

First, the ECB still has a "corridor" system because the marginal lending facility is still in place. Given the still-ample supply of liquidity, there has been little need for it but technically the upper rate of the corridor system is still in place.

Second, ESTER has recently been below the "floor" that is supposedly set by the deposit facility rate. This is because non-banks do not hold reserve accounts with the Eurosystem and so they do not get paid the deposit facility rate. These institutions are thus willing to make short-term money market loans at rates that slightly lower than the deposit facility rate. Central bankers have described this phenomenon as the system having a "leaky floor". The Federal Reserve has addressed this issue by providing an overnight reverse repo facility (ON RRP) which pays interest to non-banks at rates slightly below the rate paid to banks, so this ON RRP rate rather than the interest rate on reserves provides the floor for money market rates. The Eurosystem does not yet have such a facility.

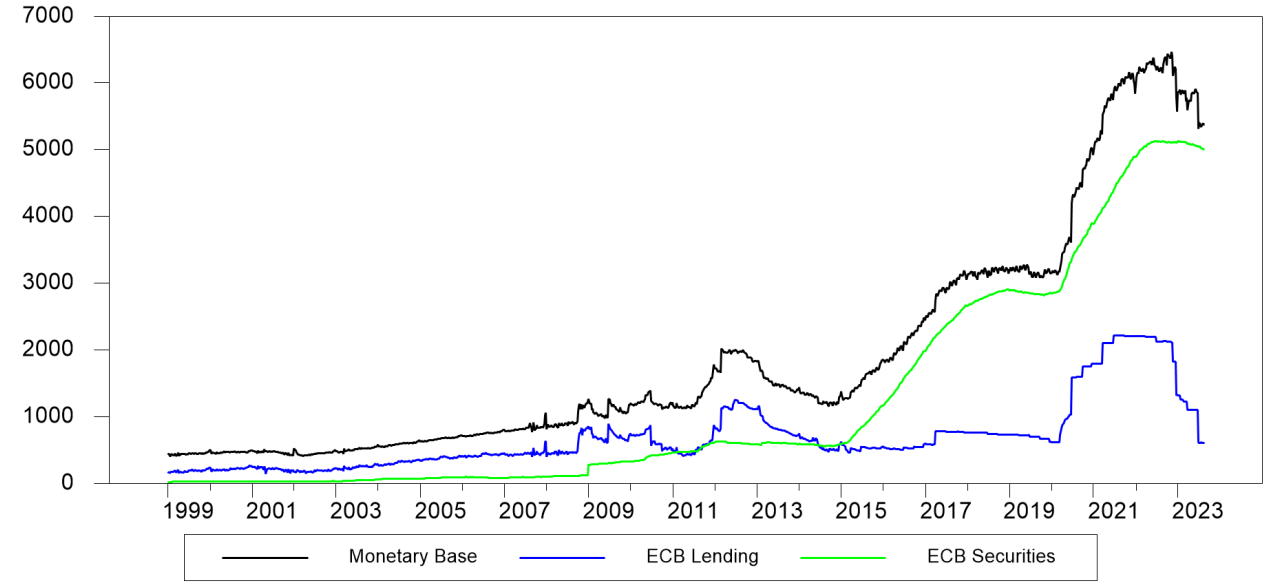
Figure 1: ECB policy rates and the EONIA\ESTER measures of market interest rates (daily data), in %



Source: Author's calculations based on data from the ECB Data Portal.

Notes: The EONIA\ESTER series is EONIA until October 2019, after which it is ESTER. During the period when these measures were both reported, ESTER was an average of 8.5 basis points lower than EONIA.

Figure 2: How the ECB determines the supply of liquidity (weekly data), in EUR billion



Source: Author's calculations based on data from the ECB Data Portal.

Notes: The black line shows currency in circulation plus deposits of commercial banks with the Eurosystem. The blue line shows total Eurosystem lending via MRO and LTRO. The green line shows the Eurosystem's holdings of securities.

3. ARGUMENTS FOR AN AMPLE SUPPLY OF RESERVES

Central banks could have decided to tighten monetary policy by taking precisely the reverse course of action to the one they took when pursuing expansionary policy. The expansionary policy saw policy rates cut to zero or below and then quantitative easing programmes were introduced. So, one option for central banks when tightening would have been to first reverse the QE programmes by selling all the securities previously acquired and then turn to raising interest rates once that was done.

However, as I discussed in a previous paper (Whelan, 2023), there are many reasons why central banks have focused on tightening monetary policy via raising interest rates and have, thus far, implemented only modest reductions in their balance sheets. Raising interest rates has a direct and powerful effect on financing conditions and can be implemented quickly. In contrast, QE programmes were implemented very gradually over time and the size of their impact on financial conditions is still a subject for debate. Furthermore, a sharp reversal of QE via large-scale sales of government bonds would likely trigger financial market instability.

This leaves balance sheet reduction as a longer-term programme for central banks to consider. From the perspective of how to operate monetary policy, the key question is whether central banks should continue supplying an "ample" quantity of reserves. Here, I will emphasise two arguments for maintaining an ample reserves regime: Its greater efficiency in implementing monetary policy and its benefits for financial stability.

3.1. Efficiency of an ample reserves regime

The ECB implemented QE later than other central banks, only starting its Asset Purchase Programme (APP) in 2015. While there were criticisms that the ECB was too slow to implement this programme, this delay gave them the advantage of learning about the implications of QE from other central banks. So, while the ECB is considering the question of how much to reduce its balance sheet, it can draw on the experience of other central banks that were already confronted with this issue when they reduced bond holdings prior the COVID-19 pandemic.

In particular, the Fed's deliberations and decisions on this issue help to explain why the Eurosystem should persist with supplying an ample quantity of reserves. In 2015, the Fed began reducing the supply of reserves by allowing some of its securities to mature. As the supply of reserves shrank, the Federal Open Market Committee (FOMC), which implements its monetary policy, requested a briefing from Fed staff in 2018 on its options for future implementation of monetary policy.

A crucial consideration in these deliberations was that the demand for reserves from banks had changed completely since the period prior to the global financial crisis. Prior to the crisis, banks were happy to operate with the lowest possible level of reserve balances and use interbank markets to make up any shortfalls. Maintaining a large supply of reserves as a precaution against a run on the bank was not something that banks considered at this time. This was part of a general nonchalance among financial institutions about potential liquidity problems. For example, most large investment banks financed a significant percentage of their operations with overnight repo market funding.

The global financial crisis exposed this relaxed attitude towards liquidity as flawed. Interbank market activity collapsed and many institutions experienced runs and required lender of last resort financing from central banks. The Basel 3 accord agreed in 2010 introduced new regulations aimed at better management of liquidity. Most notably, it introduced a Liquidity Coverage Ratio (LCR) regulation requiring banks to maintain a stock of high-quality liquid assets that would allow them to survive a stress scenario involving a sustained high level of funding withdrawals over a 28-day period.

Regulations have also been passed around the world that require banks to maintain sufficient liquidity levels to facilitate closing contracts should a bank be put through a resolution process. Each of these regulations encouraged banks to hold much larger levels of central bank reserves, which are the ultimate high-quality liquid asset.

Against this background, this summary of the Fed staff's position from the November 2018 is worth quoting at length.[38]

> "*The staff highlighted how changes in the determinants of reserve demand since the crisis could affect the tradeoffs between two types of operating regimes: (1) one in which aggregate excess reserves are sufficiently limited that money market interest rates are sensitive to small changes in the supply of reserves and (2) one in which aggregate excess reserves are sufficiently abundant that money market interest rates are not sensitive to small changes in reserve supply. In the former type of regime, the Federal Reserve actively adjusts reserve supply in order to keep its policy rate close to target. This technique worked well before the financial crisis, when reserve demand was fairly stable in the aggregate and largely influenced by payment needs and reserve requirements. However, with the increased use of reserves for precautionary liquidity purposes following the crisis, there was some uncertainty about whether banks' demand for reserves would now be sufficiently predictable for the Federal Reserve to be able to precisely target an interest rate in this way. In the latter type of regime, money market interest rates are not sensitive to small fluctuations in the demand for and supply of reserves, and the stance of monetary policy is instead transmitted from the Federal Reserve's administered rates to market rates--an approach that has been effective in controlling short-term interest rates in the United States since the financial crisis, as well as in other countries where central banks have used this approach*."

Effectively, the staff informed the FOMC that it was not sure that it would be able to estimate daily demand for reserves in an effective way and that money market interest rates were likely to be far more volatile and unpredictable if they returned to attempting to keep the supply of reserves in close alignment with daily demand. As such, returning to this approach was likely to be less efficient in controlling market interest rates and a less efficient use of staff resources, given the effort that would be required to estimate the fluctuating daily demand for reserves.

In response to this briefing, the FOMC decided in January 2019 that it intended to

> *"continue to implement monetary policy in a regime in which an ample supply of reserves ensures that control over the level of the federal funds rate and other short-term interest rates is exercised primarily through the setting of the Federal Reserve's administered rates, and in which active management of the supply of reserves is not required."*[39]

The Fed staff's arguments that the demand for reserves was unpredictable turned out to be perhaps even more true than they had realised at the time. Prior to the January 2019 decision to maintain an ample reserves regime, the Fed had been estimating the "lowest comfortable level of reserves" at which it could operate before reserve supply would start to fall short of demand. In April 2019, the head of the New York Fed's Open Market Trading Desk, Lorie Logan, reported that based on a survey of senior

[38] https://www.federalreserve.gov/monetarypolicy/files/fomcminutes20181108.pdf

[39] https://www.federalreserve.gov/newsevents/pressreleases/monetary20190130c.htm

executives in banks, the Fed believed this figure was between USD 800 million and USD 900 million.[40] However, in September 2019, with reserve balances still standing at about USD 1.4 trillion, well above the Fed's estimate of underlying demand, there were signs that the banking system's demand for reserves was exceeding its supply.

The Fed responded quickly by purchasing securities and supplying additional reserves to the banking system but it is clear that estimating daily liquidity demand for reserves is a difficult task. Overall, operating a "scarce reserves" regime seems likely to result in a less efficient monetary policy that exerts less control over money market rates and requires a lot of central bank staff effort to produce this inferior outcome. Just after the September 2019 events, two experienced former Fed officials, Joe Gagnon and Brian Sack, wrote "*The minimum level of reserves is conceptually murky, impossible to estimate, and likely to vary over time. The best approach is to steer well clear of it, especially since maintaining a higher level of reserves as a buffer has no meaningful cost*." This is the approach the Fed has taken in recent years, while also adding a "standing repo" facility in July 2021 that allows banks to borrow against Treasury bonds and agency mortgage-backed securities at rates equal to the upper bound of its target for the federal funds rate. This provides an upper bound on market rates in the same way as the ECB's marginal lending facility.

3.2. Financial stability considerations

The efficient implementation of monetary policy is the main reason for operating with an ample supply of reserves but there are also some financial stability considerations.

The events of September 2019 in the US show that reserve shortages in the banking system can have destabilising effects in financial markets. During this period, there was some disruption in repo markets, which are markets in which investors loan short-term funding for the purchase of securities with the loans collateralised by the securities that are acquired. These should be low-risk investments and the interest rates in these markets should closely follow the target money market rate of the central bank. However, during September 2019, events such as a large payment of corporate income taxes by firms withdrew liquidity from the financial system and there was a shortage of investors providing funds to the repo market. Rates in these markets spiked several percentage points above the federal funds rate on some days.

As described by Copeland, Duffie and Yang (2021), during normal times, large banks that play an active role in repo markets would step in and take advantage of higher rates on repo lending and thus these interest rate differentials would be smoothed away. But on this occasion, these banks felt they could not deploy their reserve balances in this way because they felt they were close to their minimum regulatory levels. Copeland et al. provide an explicit quote from Jamie Dimon, CEO of J.P. Morgan, confirming that this had been the case for his bank.

These financial market disturbances were relatively minor and easily fixed by the Fed supplying additional reserves to the banking system, but they show that the inefficiency of operating a scarce reserves regime for monetary policy can come with an additional set of disruptions to the functioning of financial markets.

At a more general level, there are some broader financial stability arguments for forcing the banking system to hold a large supply of central bank reserves. The key instability of the banking system stems from its lack of safe liquid assets when compared with its large amount of short-term liabilities. Forcing

[40] Logan (2019).

the banking system to hold large amounts of safe liquid assets is one way to reduce the chances of a run on the banking system.

At a more subtle level, the academic literature in financial economics has stressed in recent decades that there has often been excess demand for "safe assets" and that some of the problems seen in both the global financial crisis and the euro crisis stemmed from this shortage. Greenwood, Hanson and Stein (2016) argued that supplying a large quantity of commercial bank reserves can be seen as a financial stability tool that addresses this deficit.

3.3. Eurosystem considerations

The focus above was on the US experience due to the greater availability of evidence and research on the question of scarce versus ample reserves in that context. Of course, the Fed and ECB's monetary policy frameworks have always differed in their details and, as we will discuss below, there is no need for the ECB to precisely copy the Fed in its approach to implementing an ample reserves regime. However, the arguments just provided also work in the context of the Eurosystem to rule out a return to the ECB's pre-2008 operational system.

The Eurosystem auctioning off a fixed supply of liquidity is likely to result in very similar problems to those that have caused the Fed to continue with an ample reserves approach. I also suspect that some of the motivation for the fixed supply of liquidity approach came from defunct macroeconomic thinking. Specifically, the idea that the ECB should be targeting the broad money supply played an important role in the early years of the euro, even though few other modern central banks or academics believed this was a useful input into formulating monetary policy. The motivation for controlling the supply of reserves at a fixed level may have been related to the idea that control of the monetary base would also give the ECB some control of the broader monetary base, via the textbook "money multiplier" mechanism. But this mechanism does not work well in practice and the ECB has long since given up its operational target for M3 growth. As such, there are few good reasons for going back to supplying a fixed quantity of reserves to the banking system.

4. ARGUMENTS FOR A SMALLER BALANCE SHEET

For the reasons just outlined, it is highly unlikely that the ECB will chose to return to its pre-2008 "scarce reserves environment" operational approach. However, there are many arguments for why it should implement a substantial reduction in the coming years in the size of its balance sheet and the corresponding huge amounts on deposit from commercial banks. Here, I present several arguments for doing this, some of which I agree with more than others.

4.1. Monetary financing and firepower for TPI

I have written previously in these briefing papers and elsewhere about the potential for the ECB's asset purchase programmes to violate the Treaty's provisions on monetary financing.[41]

Under a narrow interpretation, the Treaty only rules out direct purchases of securities from governments by the Eurosystem and so the secondary market purchases of recent years do not violate the Treaty. However, the European Court of Justice's approach to assessing this issue, illustrated in the 2018 *Weiss* judgment, was that the programme needs to be assessed against the underlying intent of the monetary financing article in the Treaty rather than its specific wording.[42] The Court argued that the aim of the article was to encourage Member States to follow a sound budgetary policy and any actions by the ECB that undermined this aim would be illegal.

The *Weiss* judgement ruled that the ECB's actions in introducing the Asset Purchase Programme (APP) were lawful but pointed to a number of reassurances provided by the ECB in arriving at this decision. The judgement approvingly cited the ECB's requirement that bonds could only be purchased if they had a sufficiently high credit rating as encouraging governments to maintain sound budgetary policies. The Court also stressed the ECB's commitment to limit the fraction of debt that it could purchase from each issuer maintained a primary role for financial markets in setting financing terms for sovereign debt funding.

Since this judgement, the ECB entered into a another major round of sovereign bond purchases, weakened its requirements on credit ratings and has argued that its issuer limits were a self-imposed requirement that it can choose not to follow. In my opinion, unless the ECB sets a path to firmly reduce its sovereign bond holdings, it runs the risk that future cases against it could rule that the ECB's actions violate Article 123.

Another reason for the Eurosystem to reduce its holdings of sovereign bonds is that it may be necessary for the ECB to have sufficient "firepower" available should it ever decide to implement the new Transmission Protection Instrument (TPI). One interpretation of the Weiss judgement is that it places an effective upper limit of just below 50% on Eurosystem ownership of sovereign debt. The higher the Eurosystem's bond holdings are at the time it implements a TPI intervention, the more likely it is that this 50% limit binds as a limit on the size of its potential intervention. The more markets see the ECB as having a small rather than a big bazooka, the less likely the TPI intervention will be to succeed.

4.2. Fiscal implications and political complications

Another reason to operate with a small Eurosystem balance sheet is that the large balance sheet is drawing the ECB into contentious politicised discussions that may threaten its long-run independence.

[41] Whelan (2022) provides a detailed discussion of these issues.

[42] Materials on the *Gauweiler* case are available at https://curia.europa.eu/juris/liste.jsf?num=C-62/14 and on the *Weiss* case at https://curia.europa.eu/juris/liste.jsf?language=en&num=C-493/17

While officially a monetary policy, QE programmes can have substantial fiscal implications. The ECB's asset purchase programmes lowered the cost of long-term fiscal borrowing and governments are still benefitting from having had a long period where they locked in lots of long-term low interest financing. These programmes also initially lowered the net burden of fiscal debt for euro area governments because interest payments on sovereign bonds went to central banks who recycled them back to governments via their annual profit dividends.[43]

The move to higher policy rates has reversed these positive fiscal developments. Sovereign bond yields have risen so new borrowing for government is becoming more expensive. The Eurosystem's national central banks are no longer making profits because the interest received from the low-yielding long-term bonds they purchased is now being offset by the interest payments on the deposit facility due to its monetary tightening.

This reversing of the fiscal boost from asset purchase programmes will generate negative publicity for the ECB and the national central banks. Indeed, as Borio (2023) notes about the larger interest payments being made to banks, the perception that central banks are subsidising commercial banks is politically unpopular, even if it can be defended as a consequence of monetary policy. There is also a clear link between the ECB's policy on interest on reserve balances and the recent Italian government decision to introduce a special tax on bank profits.

I have suggested previously that the ECB should consider re-introducing the two-tier system of reserves that it employed when the deposit facility rate was negative but in this case to compensate the first tier of reserves at a lower rate than the second tier.[44] This approach would maintain control of market interest rates while reducing the fiscal cost associated with monetary policy. But even though I favour this approach, it should be acknowledged that introducing it would generate huge criticism from the powerful and politically well-connected banking sector lobby, who portray (incorrectly in my opinion) any reduction in the interest they earn on reserves as a "tax on banks".

Large central bank balance sheets also trigger less justifiable concerns from those who do not understand the complexities of modern central banking. There is considerable online demand for the output of "goldbug" style commentators who bemoan central banks as "debasing the currency" and advise people to purchase gold or cryptocurrencies to avoid the inevitable (but never actually arriving) upcoming hyperinflation. These views will always be with us but a sustained reduction in the size of the Eurosystem's balance sheet may help to cool off some of this kind of commentary.

4.3. Financial market distortions

A final set of complications due to the large supply of reserves, that have been emphasised by Borio (2023) and others is that a large supply of reserve balances causes distortions in various financial markets. I am not convinced, however, that these costs are large. For example, Borio argues that the ample supply of reserves has effectively "killed" inter-bank markets but, given that we have experienced a long period with minimal activity in these markets without any negative repercussions, it is not clear they are necessary or need to play an important role in the financial system.

Borio also stresses that large holdings of sovereign bonds by central banks can generate a shortage of individual securities which can raise interest rates on "specific collateral" repo operations where institutions seek to borrow specific bonds. Others view the "leaky floor" property discussed above, in

[43] See Whelan (2020) for a more detailed discussion of the fiscal implications of the ECB's asset purchase programmes.

[44] See Whelan (2023). Paul de Grauwe has made similar arguments. Here is a video of a recent presentation he gave on this topic at the Deutsche Bundesbank. https://www.bundesbank.de/de/service/termine/professor-paul-de-grauwe-zu-gast-in-der-bundesbank-913964

which short-term market interest rates are below the interest paid on reserves as a distortion compared with previous periods in which there were smaller discrepancies between the short-term interest rates earned by banks and other financial institutions.

It is not clear to me that these distortions, if such they are, are something for the ECB to be concerned about. If they are concerned about the "leaky floor" issue, they could design a programme similar to the Fed's ONRRP to address it. But different kinds of short-term rates having different values does not compromise the monetary transmission mechanism. The financial system has always generated a wide variety of interest rates on different instruments. By adjusting its deposit facility rate, the ECB can ensure that all of these interest rates move up and down in line with the policy rate and that the overall cost of financing in the economy is in line with its preferred levels.

A final distortion is the possibility that the forced expansion of the aggregate balance sheet of the commercial bank sector due to central bank asset purchases has forced banks out of business lines that they had previously been involved in. Deposits with central banks have a risk weight of zero for regulatory capital purposes and thus have no impact on capital requirements if the risk-based capital requirement is the most relevant binding regulation, as is usually the case. However, these deposits are counted as part of the non-risk-weighted leverage ratio, introduced as part of the Basel 3 process and could crowd out other activities if this is the binding constraint. Duffie (2023) points out that the Supplementary Leverage Ratio regulation applied to large US banks by the Federal Reserve (which applies a higher unweighted capital requirement than in the EU) appears to have restricted the ability of these banks to provide dealer services, thus damaging liquidity in the systemically important Treasury market.

These distortions will likely be alleviated by a reduction in central bank balance sheets from their current size. There may also be a case for adjusting certain aspects of monetary or regulatory policy to deal with these issues but they do no amount to a case for returning to a scarce reserves environment.

5. OPTIONS FOR THE EUROPEAN CENTRAL BANK

Given the likelihood that the ECB will continue to provide an ample supply of reserves and use the deposit facility rate as its key policy rate, how much liquidity should it plan to provide in the future? One model to follow is the current approach of the Federal Reserve. In seeking to avoid the difficulties of September 2019 re-occurring, the Fed is committed to maintaining a supply of reserves that is well above its (admittedly uncertain) estimates of the underlying demand for reserves from commercial banks.

But this is not the only way to do this. In a recent speech, ECB Executive Board member Isabel Schnabel (2023) noted that the Bank of England have announced an alternative approach.[45] Instead of targeting a specific level of reserves that it believes to be ample, the Bank of England are introducing a short-term repo facility that allows banks to borrow as much reserves as they want, subject to them having the collateral required to secure these loans. This approach would mean that when the Bank of England reaches a point in the future where the supply of reserves created from the Bank's sovereign bond holdings starts to fall below the needs of the banking sector, then banks can use the short-term repo facility to avail of the required reserves.

This approach allows the banking sector itself to determine the amount of reserves required and thus set the overall size of the central bank's balance sheet. It does not require extensive (and perhaps fruitless) efforts to estimate the day-to-day demand for reserves from the banking system. It also stops banks from having to continually execute the additional transactions associated with continuously seeking to shift unwanted reserves off their balance sheet. Evidence for this activity among euro area banks was presented by Ryan and Whelan (2021).

Schnabel (2023) noted a number of positive features of the Bank of England's standing repo plan but, in fact, the ECB is already better positioned than the Bank of England to implement a long-term demand-driven balance sheet policy. The Bank of England's standing repo facility only accepts "Level A" assets as collateral, limiting the assets that can be used to sovereign bonds issued by a small number of countries. This could potentially see some banks get into difficulties if they have insufficient collateral to secure the reserves they need.

In contrast, the ECB already has a comprehensive eligible collateral list for use in its refinancing operations, including plenty of lower-rated assets that can be used provided a relevant "haircut" is applied (e.g. a 30% haircut would mean an asset worth EUR 100 million could be used to secure funding of EUR 70 million). The key to ensuring there is a sufficient quantity of reserves available in the future will thus be for the ECB to continue with its "full allotment" approach to its refinancing operations. This approach will allow the ECB to gradually reduce the size of its balance sheet without having to worry about the instabilities that would emerge from occasional shortages of reserve balances.

[45] The details behind the Bank of England's facility, announced in August 2022, are here https://www.bankofengland.co.uk/markets/market-notices/2022/august/short-term-repo-facility-provisional-market-notice-4-august-2022

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As monetary policy continues to tighten and excess liquidity is gradually drained from the banking system, the European Central Bank (ECB) is confronted with a decision on which liquidity provision framework the Eurosystem should adopt going forward. Three papers were prepared by the ECON Committee's Monetary Expert Panel, discussing the relative advantages and disadvantages of the ample reserves/floor system versus the scarce reserves/corridor system.

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