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Steffen Murau, Alexandru-Stefan Goghie and Matteo Giordano

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Department of Economics  
SOAS University of London  
Thornhaugh Street, Russell Square, London WC1H 0XG, UK  
Phone: + 44 (0)20 7898 4730  
Fax: 020 7898 4759  
E-mail: [economics@soas.ac.uk](mailto:economics@soas.ac.uk)  
<http://www.soas.ac.uk/economics/>

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# Encumbered Security? Conceptualising Vertical and Horizontal Repos in the Euro Area

Steffen Murau\*

Alexandru-Stefan Goghie<sup>†</sup>

Matteo Giordano<sup>‡</sup>

## Abstract

Despite the paramount centrality of repurchase agreements (repos) in today's market-based finance regime, both conceptual and empirical questions about European repo markets are insufficiently explored as contradictory legal and accounting treatments make their on-balance-sheet representation intricate. Drawing on the literature on monetary hierarchy, we make three connected conceptual arguments: First, we argue that the balance sheet mechanics of repos vary if the counterparties involved are on hierarchically different levels ("vertical repos") or on the same hierarchical level ("horizontal repos"). While the vertical repo mechanism implies money creation, the horizontal repo mechanism only lends on pre-existing money. Second, we coherently represent the whereabouts of the security posted as repo collateral, which is held as an off-balance-sheet position of the repo lender, combined with a liability to repay it. Basel III regulations interpret this ambiguous status of the collateral as being "encumbered" and not leaving the repo borrower's balance sheet. Third, we introduce an on-balance-sheet notation of the collateral framework as a means of the repo lender to alter the elasticity of the funding provided. Applying our methodology on two cases—vertical repos created by the Eurosystem for monetary policy implementation and horizontal repos used in the European interbank market—offers an innovative and consistent way to represent changes in the collateral frameworks that affect the elasticity space in the Euro area's monetary architecture. Our analysis yields two main contributions: We offer a novel understanding of different mechanisms for repo creation based on monetary hierarchy, and we put forth a data-driven empirical analysis of repos in Europe aimed at supporting our conceptual elaborations.

**Keywords:** Repurchase agreements; collateral; market-based finance; Eurosystem; European Central Bank; Eurex clearing.

**JEL classification:** G21; G23; E58.

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\* Global Climate Forum, Berlin; Freie Universität Berlin; Global Development Policy Center, Boston University. Email: [steffen.murau@globalclimateforum.org](mailto:steffen.murau@globalclimateforum.org)

<sup>†</sup> Freie Universität Berlin. Email: [goghiea95@zedat.fu-berlin.de](mailto:goghiea95@zedat.fu-berlin.de)

<sup>‡</sup> Department of Economics, SOAS University of London. Email: [mg92@soas.ac.uk](mailto:mg92@soas.ac.uk)



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## 1. Introduction

During World War I, a new financial instrument became fashionable for the Federal Reserve (Fed) to conduct its monetary policy operations: repurchase agreements or “repos” (Harris 1933, 289). The US central bank had been founded just before the war, after years of struggle between different political fractions about its design (Orian Peer 2019). The Federal Reserve Act of 1913 provided the Fed with a mandate to conduct monetary policy primarily by discounting short-term commercial paper, thus applying the traditional “real bills doctrine” (Mints 1945), and only exceptionally with some forms of short-term government debt. Legitimate counterparties were only member banks, i.e. commercial banks that had become members of one of the Fed’s district central banks (US Congress 1913, Sec. 13-14). Repos were a convenient way to circumvent these restrictions and extend both the set of eligible counterparties and eligible securities to receive central bank credit. Originally used to avoid a stamp tax on advances on promissory notes of member banks, the Fed harnessed repos to support the war finance activities of the US government after it had entered World War I in 1917 (Harris 1933, 289–90). Organized as a sale and repurchase of a security, repos did not legally appear to be a lending operation regulated by the Federal Reserve Act. Hence, they allowed the Federal Reserve Bank of New York (FRBNY) to put significant shares of Liberty bonds, issued by the US Treasury as long-term debt to raise funds for the war, onto its balance sheet without discriminating between member and nonmember banks (FRBNY 1919, 24–25). Reservations of the Fed’s legal counsel were brushed aside, who argued that these transactions were not sales, as they pretended to be, but in fact secured loans and therefore *ultra vires*, beyond the scope the Fed’s powers (Harris 1933, 290). In retrospect, repos proved to be a successful way to facilitate unprecedented financial expansion of central bank and treasury balance sheets because they have an *inherent ambiguity* about whether or not they involve credit creation—both of central bank money and a repo IOU (debt certificate, as in *I owe you*)—and conceal what happens with the security that is “allegedly” being sold.

Fast forward to today, repos have become a key instrument in the world of globalized finance and are widely used by both central banks and private institutions. Since the 1950s, repos have been employed in US money markets to circumvent New Deal banking regulations, fostering what today is called the “shadow banking system” (Mehrling 2011; Awrey 2013; Menand 2022). Even though rulings of common law courts and regulatory changes have attempted to provide more clarification about the nature of repos (Garbade 2006), they remain an inherently ambiguous instrument that sometimes is referred to as a form of “shadow money” (Ricks 2011; Pozsar 2014; Gabor and Vestergaard 2016; Murau 2017). It is widely recognized that contractions in the repo market lay at the heart of the 2007-9 Global Financial Crisis (GFC). Some perceived repos even as the instrument that elevated a real estate crisis and the bursting of a mortgage securitization scheme to global proportions (Gorton and Metrick 2012). The part of Lehman Brothers that went bankrupt was the bank’s repo dealer that confused customers, regulators, and eventually themselves about the

volume of repos outstanding and the whereabouts of the repo collateral (McDonald 2015, Ch. 5).

Less widely studied—both conceptually and empirically—are repos in Europe which have many similarities but also important differences to those in the US (Hardie et al. 2013; Wu and Nabilou 2019). Conceptually, it is a common tendency in the small literature on European repos to not systematically distinguish between repos that are used for the purpose of monetary policy implementation by the Eurosystem and those that are used between private financial market participants (ECB 2002; Pisany-Ferry and Wolff 2012). Empirically, the macro-financial role of the European repo market in the European sovereign debt crisis is still insufficiently explored. It is true that there have been in-depth quantitative analyses on the dynamics of European repo market stress (e.g. Boissel et al. 2017) and pioneering work on European repo regulation (Gabor 2016; Gabor and Ban 2016). Still, repos played a central but underappreciated role during the Eurocrisis: on the one hand, the repo markets replaced unsecured interbank lending early on in the crisis; on the other hand, it provided an important channel for the spread of the contagion through the European monetary and financial system, not only across countries but also across balance sheets given that repos connect financial, banking, and shadow banking balance sheets via the securities posted as collateral. The exact dynamics of European repo markets have so far insufficiently been modelled. We believe that the underlying reason for this gap is connected to the fact that repos from the start had one paramount purpose: being ambiguous.

Balance sheet methodology—as it has been developed, for instance, in the context of the Money View (Mehrling 2011) and the (critical) macro-finance literature (Gabor and Vestergaard 2018; Gabor 2020; Dutta et al. 2020; Murau and Pforr 2020)—has the potential to provide clarification about the ambiguity of repos. While money creation is notoriously difficult to conceptualise (Bezemer 2016), balance sheet methodology offers the appropriate analytical categories that are “true” for the nature of the object of analysis (cf. Keynes 1933). It acknowledges that the rules of double entry book-keeping, according to which an instrument always must simultaneously exist as an asset and a liability on two balance sheets, do not just *represent* reality, they *create* reality. Thus, the shift towards analysing webs of interlocking balance sheets after the GFC was a quantum leap in new economic thinking (Tooze 2018). With the potential to connect the balance sheets of central banks, commercial banks, and non-bank financial institutions while typically using treasury securities as collateral, repos uniquely bridge all segments of the “monetary architecture” (Murau 2020). This makes repos one of the quintessential use cases for balance sheet methodology.

However, we believe that there are three conceptual issues related to balance sheet methodology that hinder a satisfactory analysis of repos in a European context.

First, there are open questions regarding the extent to which repos involve the creation of *credit* as well as *credit money*. If repos are more than a “credit-less” sale



and repurchase of a security, in which way exactly do they expand the liability sides of the counterparties involved? This applies both to the creation of the repo IOU, which we may or may not classify as “shadow money”, and the potentially associated creation of “standard” forms of money such as central bank reserves or bank deposits. For instance, some notation styles involve a symmetric expansion of both counterparties’ balance sheets with a “repo” against reserves (Mehrling 2011, 98), an “overnight repo” against a “term repo” (Pozsar 2014, 15), or both (Michell 2017, 372), whereas others perceive the repo issuance as expanding only one of the counterparties’ balance sheet (Gabor and Vestergaard 2016, 18; 2018, 149) or as being balance sheet neutral (Gabor and Vestergaard 2016, 16) and possibly destroying bank deposits (Sissoko 2019). Alternative analyses of repos that make money creation analogies but do not explicitly use balance sheet visualisations argue on the basis of loanable funds theory (Gorton and Metrick 2012; cf. Michell 2017) or use concepts of fractional reserve banking theory such as the money multiplier (Gorton 2010).

Second, there is presently no entirely satisfactory solution for depicting the repo mechanism on-balance-sheet that clarifies the whereabouts of the security used as collateral during the maturity period of the repo. Many representations that emphasise the credit character of the repo transaction abstract from the security altogether (Mehrling 2011; Pozsar 2014), whilst others seek to integrate the security by abstracting from the repo IOU (Gabor and Vestergaard 2018). Neilson (2021b) comes closest to a full picture, but in his depiction the repo collateral seems to be simply held on the balance sheet of the repo lender which cannot be the full story. From our perspective, the lack of clarity on where the security is during the maturity period of the repo is the most important factor of what we perceive as repos’ *inherent ambiguity*.

Third, there is a conceptual gap in the literature that would allow appropriately grasping the specific European context because repo analyses mostly refer to a US setting. From a “micro-financial” view, it is not fully clear what the similarities and differences are between repos with the Eurosystem and interbank repos. Things are further complicated by the fact that most European countries have their own repo-related legacy structures. A “macro-financial” issue is how balance sheet methodology can clarify the systemic implications of the Eurosystem’s collateral framework and its function in providing a backstop to the European monetary architecture. While narrative accounts stress the importance of changing rules for collateral eligibility (van ’t Klooster 2022), there is not yet a solution for an on-balance-sheet representation of those mechanisms.

In this paper, we propose a novel solution to depict repos on-balance-sheet that remedies those issues. Drawing on the literature on monetary hierarchy (see e.g. Mehrling 2012; Neilson 2021a; 2021b; Murau, Pape, and Pforr 2023), we make three connected conceptual arguments. First, we argue that the balance sheet mechanics of repos vary if the counterparties involved are on hierarchically different levels (“vertical repos”) or on the same hierarchical level (“horizontal repos”). While the

vertical repo mechanism implies money creation, the horizontal repo mechanism only lends on pre-existing money. Second, we provide a coherent representation of the security posted as repo collateral, which is only held as an off-balance-sheet position of the repo lender, combined with a liability to repay it. Pillar 3 disclosure requirements of Basel III interpret this ambiguous status of the collateral as being “encumbered” and not leaving the repo borrower’s balance sheet. Third, we introduce an on-balance-sheet notation of the collateral framework as a means of the repo lender to alter the elasticity of the funding provided. In sum, we propose a notation style that allows to simultaneously depict the creation of a repo IOU, the creation or redistribution of hierarchically higher money, the whereabouts of the security used as collateral in a transactional balance sheet representation, and the collateral framework as a *de facto* policy tool for the repo lender in a static balance sheet representation.

To demonstrate the merits of our repo conceptualisation, we apply the notation style on the two most relevant cases for the Euro area’s monetary architecture and connect it with the publicly available data. On the one hand, vertical repos play a key role for monetary policy implementation of the Eurosystem. Our methodology clarifies that securities pledged as repo collateral are *de facto* off-balance-sheet positions of the national central banks. Moreover, the methodology allows us to depict on-balance-sheet how the Eurosystem designed its collateral framework and changed it over time to affect the elasticity space on the balance sheets of both central banks and banks. On the other hand, horizontal repos are used for secured interbank borrowing and lending. Our methodology allows clarifying the balance sheet mechanics involved in both General Collateral and Special Collateral repos, whether carried out bilaterally or via a Central Counterparty (CCP). As a result, we are able to show on-balance-sheet how CCPs have mimicked the transformation of the Eurosystem’s collateral framework and thus extended the Eurosystem’s policy interventions to private repo markets.

The results of our analysis contribute to several ongoing debates. First, our conceptual arguments are relevant for scholars who work in the Money View or critical macro-finance frameworks and seek to carry out empirical analyses of repo markets worldwide. The distinction of vertical and horizontal repos clarifies under which conditions repo issuance coincides with the creation of “standard” forms of money. The clarification that the collateral is held off-balance-sheet by the repo lender during the maturity period helps understand repos’ inherent ambiguity and the ongoing struggles of regulators who now double down on the encumbrance concept (CGFS 2013). We hope that our proposed methodology can help advance more general debates on shadow banking, shadow money, and the wider institutional reality of market-based finance (Thiemann 2018; Pistor 2019). Second, our empirical analysis contributes to studies of repos in Europe, both as a monetary policy tool and as a mechanism for secured interbank lending (Gabor 2016; Gabor and Ban 2016; Braun 2020; Wansleben 2020). We also speak to the literature about the implications

of the Eurosystem's collateral framework on the Eurocrisis (Orphanides 2017; Nyborg 2017; Van 't Klooster 2021; 2022; Vestergaard and Gabor 2022).

The remainder of this paper is organized as follows. Section 2 introduces our proposed balance sheet methodology to conceptualise vertical and horizontal repos. Section 3 applies this methodology on vertical repos as monetary policy instrument in the Euro area, section 4 on horizontal repos in the Euro area's interbank market. Section 5 concludes by sketching avenues for future research, in particular the usage of the proposed methodology to study the role of repos in the Eurocrisis.

## 2. Balance sheet methodology

### 2.1 Vertical vs. horizontal repos

The literature on repos typically gives the impression that repos are one unitary category of financial instruments that can be put to use in different contexts—e.g., by central banks for monetary policy implementation (CGFS 1999; Bindseil and Nyborg 2007), by banks for borrowing and lending on the secured interbank market (Schaffner, Ranaldo, and Tsatsaronis 2019), or by securities dealers for market making as part of the shadow banking daisy chain (Pozsar et al. 2012; Adrian et al. 2013; Kolchin, Podziemski, and Mostafa 2022). In those instances, repos appear to be fundamentally the same type of instrument: The first leg of the repo transaction means the sale of a security while the counterparty borrows a form of money; the second leg is the reversal of this transaction when the security is returned and the money instrument is paid back (Garbade 2006; Meneghini 2019).

From our perspective, the view that there is only one type of repos misses out on important nuance. It is not wrong per se, but it conceals one important fact—that there are different types of balance sheet mechanisms to create repos. This nuance typically gets lost because the term “repo” has a double meaning—it is both a type of *instrument* and a *balance sheet mechanism* to create such instruments. While there is only one type of repo instrument, there are two types of repo balance sheet mechanisms.

On the one hand, as *instruments*, repos appear simultaneously as IOUs on the asset and liabilities sides of the counterparties once a repo contract is concluded. In accounting terms, the “repo” entry on the balance sheets refers to a “repo claim” when on the asset side, and to a “repo liability” when on the liability side. It is helpful to think of the repo claims as the temporary legal claim to the security posted as collateral, and not as the security itself that appears on the balance sheet. Similarly, a repo liability indicates the future promise to repurchase the legal ownership of the security posted as collateral at maturity.

As a sidenote, a frequently made distinction separates “*repos*” and “*reverse repos*”, which may be taken to refer to different repo instruments. Yet, this distinction merely denotes a difference in perspective on who initiates the transaction and if the motivation is to secure cash (“repo”) or the security (“reverse repo”) (cf. ICMA 2024). Both “repo” and “reverse repo” are in fact the same instrument that appears simultaneously as a “repo claim” on one balance sheet and as a “repo liability” on another.

On the other hand, as a *balance sheet mechanism*, repos refer to the operation through which repo claims and repo liabilities are put into existence. The general shape of repos as a balance sheet mechanism varies with whether the counterparties are located on different hierarchical levels in the monetary architecture (Murau 2020) or whether they are on the same one. To help us distinguish both categories, we call the first balance sheet mechanism “vertical repo”

(as it crosses hierarchical layers) and the second one “horizontal repo” (as it remains on the same hierarchical layer).

To substantiate our point that there are two balance sheet mechanisms which lead to the creation of repos, we mobilise the matrix of quadruple-entry-consistent financial transactions introduced by Neilson (2021a). It is depicted in [Figure 1](#). The matrix offers a complete list of possible balance sheet operations between two counterparties that formally comply with the rules of double-entry bookkeeping. This necessarily involves four booking entries of IOUs, two on each balance sheet, which are either additions or subtractions of instruments on the balance sheets’ asset or liabilities side. Importantly, for each individual balance sheet, the additions and subtractions must maintain the same length on both sides of the balance sheet. This gives rise to three options: First, a *balance sheet expansion* involves symmetric additions on both the asset and the liabilities side; this is akin to net *credit creation*. Second, a *balance sheet contraction* entails a systematic subtraction on the sides of the balance sheet, which is akin to net *credit destruction*. And third, a *balance sheet neutral transaction* involves that both an expansion and a contraction happen on the same side of a balance sheet, either the asset or the liability side; in this case, there is *no change of net credit* in the system.

**Figure 1: Matrix of sixteen quadruple-entry-consistent financial transactions**

Asset Swap 	Asset disintermediation 	Asset intermediation 	Transfer of portfolio 
Asset disintermediation 	Repayment 	Refinance 	Liab. disintermediation 
Asset Intermediation 	Refinance 	Secured loan 	Liab. intermediation 
Transfer of portfolio 	Liab. disintermediation 	Liab. intermediation 	Liability swap 

Source: Neilson (2021a)

The balance sheet mechanism to create repo instruments can either correspond to the operation that Neilson calls a “secured loan” in the matrix, which involves an expansion of both balance sheets and could also be referred to as a “swap of IOUs” (Mehrling 2011; Murau and Pforr 2020), or to “asset intermediation”, in which only one balance sheet expands while the other keeps the same length. Which of the two mechanisms applies depends on the *relative* position of both balance sheets vis-à-vis each other in the monetary hierarchy. The mechanism of a “secured loan” (or “swap of IOUs”) sets in if one balance sheet is hierarchically higher than the other

and thus corresponds to a “vertical repo”. The mechanism of “asset intermediation” applies if both balance sheets are located on the same hierarchical level and are thus equivalent to a “horizontal repo”.

Figure 2 shows the balance sheet mechanism for the first leg of a vertical repo, when the counterparties are located on different hierarchical levels. This operation gets reversed with the second leg of the repo, which is not included in the figure. In this example, we choose a central bank and a bank as institutions and reserves as credit money instrument. Alternatively, we could also shift further down in the hierarchy and refer e.g. to a bank and a money market fund or a money-center and a peripheral bank as institutions and deposits as instruments. The hierarchically lower institution (“repo borrower”) creates the repo as a liability that can be held as an asset on the balance sheet of the institution that is hierarchically higher (“repo lender”). In return, the hierarchically higher institution creates a new liability that the hierarchically lower institution can treat as money.

**Figure 2: Vertical repos as new money creation**

Central Bank (repo lender)	Bank (repo borrower)
+ Repo	+ Reserves
+ Reserves	+ Repo

As the balance sheet mechanism of the vertical repo expands both balance sheets simultaneously, it coincides with the creation of new hierarchically higher money, here in the form of central bank reserves. By contrast, if the counterparties are located on the same level in the monetary hierarchy, the underlying balance sheet mechanism does not entail money creation.

Figure 3 depicts the case of a horizontal repo which is a form of securitized interbank lending. In this example, Bank B (“repo borrower”) wants to borrow reserves from Bank A (“repo lender”). To this end, Bank B issues a repo as a liability and transfers it to Bank A, which holds it as an asset. The operation will be reversed at maturity. As the balance sheet mechanism of a horizontal repo only involves a net expansion of one of the two balance sheets, the creation of the repo claim and liability does not coincide with new money creation. Rather, the repo serves to lend out previously created money, here central bank reserves. The operation only implies an expansion of Bank B’s balance sheet while Bank A replaces one asset in the form of reserves with another asset in the form of a repo.

**Figure 3: Horizontal repos as borrowing and lending pre-existing money**

Bank A (repo lender)	Bank B (repo borrower)
- Reserves + Repo	+ Reserves
	+ Repo

In sum, the distinction between vertical and horizontal repos as two different quadruple-entry consistent balance sheet mechanisms helps clarify the question whether or not the issuance of a repo corresponds to new money creation—it depends on the relative position of the counterparties within the hierarchy of money.

## 2.2 The “encumbering” asset swap on the repo borrower’s balance sheet

The proposed depiction of vertical and horizontal repos still abstracts from the security that is used as collateral. This notation style does not clarify the difference between repo as collateralised lending in contrast to non-collateralised lending, and it does not provide an answer to where the collateral is during the maturity of a repo.

*Prima facie*, as it is the defining feature of a repo to be a sale and repurchase of a security, it could be natural to think of a repo transaction as an “asset swap” (cf. Figure 1) at  $t=0$  and the reversal of the asset swap at  $t=1$ . [Figure 4](#) visualises this hypothetical case in which the asset is transferred from one balance sheet to another. The repo borrower (Counterparty B) passes on a security to the repo lender (Counterparty A) in exchange for reserves, and the transaction is reversed at maturity.

**Figure 4: Repo imagined as asset swap with security changing balance sheets**

	Counterparty A (repo lender)	Counterparty B (repo borrower)
t=0	- Reserves + Security	+ Reserves - Security
t=1	+ Reserves - Security	- Reserves + Security

The depiction in Figure 4 would be the most literal on-balance-sheet representation of the repo operation in a way that abstracts away entirely any credit creation involved. It corresponds to the *legal treatment* of repos in the Euro area where they are considered an outright sale of a security with a full transfer of ownership (“title transfer”) (Wu and Nabilou 2019)—unlike in the US where the repo is treated as collateralised lending without full “title transfer” (Baklanova, Copeland, and McCaughrin 2015). However, both in the Euro area and the US, the *accounting treatment* of repos differs from the legal treatment (Comotto 2012; Gabor and Vestergaard 2018); repos are seen as a lending operation that clearly involves credit creation. How can we bring together the legal and accounting treatment with balance sheet methodology and align the aspect of credit creation in a repo with the exchange of the security used as collateral?

We argue that the discrepancy of legal and accounting treatment can be reconciled by integrating a second quadruple-entry-consistent operation that traces the whereabouts of the security. [Figures 5 and 6](#) depict this for both vertical and horizontal repos which includes a given Security X used as collateral.



**Figure 5—Vertical repo with an encumbered security as collateral**

Central Bank (repo lender)		Bank (repo borrower)	
+ Repo	+ Reserves	+ Reserves	+ Repo
Central Bank's Off-Balance-Sheet Positions			
+ Security X	+ Security X due	- Security X	+ Security X due

**Figure 6—Horizontal repo with an encumbered security as collateral**

Bank A (repo lender)		Bank B (repo borrower)	
- Reserves		+ Reserves	+ Repo
+ Repo			
Bank A's Off-Balance-Sheet Positions			
+ Security X	+ Security X due	- Security X	+ Security X due

This proposed notation style combines conceptual arguments on repo accounting brought forth by Neilson (2021b) and Banal-Estañol et al. (2021).

On the one hand, we follow Neilson (2021b) in the depiction of the transaction. The security shifts place on the asset side of the repo borrower's balance sheet from being held outright to being "due", awaiting to be transferred back. On the repo lender's side, a balance sheet expansion takes place. The security is booked on the asset side whilst it is "due" as a liability, indicating the promise to return it upon maturity of the repo. Other than pretending that the repo is an asset swap, i.e. a true sale of the security (as presented in the hypothetical Figure 4), this operation stresses the credit character involved in the transfer of the security by depicting the booking entry of "asset intermediation" (cf. Figure 1).

On the other hand, we follow the argument of Banal-Estañol et al. (2021, 43) that the security must be held as an off-balance-sheet position of the repo lender. While it is necessary to for the repo lender to have a corresponding entry to the repo borrower's booking of "- Security X" and "+ Security X due" to comply with the rules of quadruple-entry-consistent accounting, the security cannot formally touch the repo lender's balance sheet as this would be equivalent to an outright sale of the security. Therefore, we introduce an "off-balance-sheet balance sheet" for the repo lender to allow for a complete representation of the repo transaction.

The proposed notation style in Figures 5 and 6 offers what has so far been missing in the literature on balance sheet methodology for repos. It simultaneously conveys, first, how credit creation takes place in the form of a repo IOU. Second, it clarifies whether or not another credit money instrument is created, depending on whether the balance sheet mechanism corresponds to a vertical or a horizontal repo. And

third, it includes the security that is used as collateral and shows how it ends up as the repo lender's off-balance-sheet position during the maturity period of the repo.

Interpreting the security as being temporarily held as an asset off-balance-sheet by the repo lender with a corresponding off-balance-sheet liability to return the security offers an answer to the question where the security is during the period of the repo contract. At the same time, it is far from self-evident what it means in practice that a security is held off-balance-sheet. This helps clarify why there is an *inherent ambiguity* to the repo mechanism. In fact, the off-balance-sheet booking entry allows ample space for flexible interpretations about the nature of the repo transaction and the whereabouts of the security. Let us look at three examples for this.

First, consider the US war finance effort when the Fed supported the liberty bonds issuance in 1917. The inherent ambiguity of the repo mechanism made it possible for the Fed to accept the securities of nonmember banks as collateral without having to let them formally touch its balance sheet, which was prohibited by the Federal Reserve Act. Repos complied with the letter of the law because by accepting them as repo collateral, the securities were held off-balance-sheet, not on-balance-sheet.

Second, Garbade (2006) gives a convincing example of how the inherent ambiguity of repos contributed to their success as a financial instruments on US private markets. In the 1970s and early 1980s, when the shadow banking system was only developing, it was never fully specified what happened to the security in the repo contract, i.e. if it was an outright sale or a collateralised loan. Garbade (2006, 34–35) quotes a repo dealer at the time: "We left [the characterization of a repo] purposely vague because doing so fit our needs. If a customer said, 'I can't do repo,' we said, 'OK, we will sell you securities and buy them back.' If another customer said he could not buy securities, we said, 'Fine, we will borrow money from you and give you collateral.' It was all very convenient". Hence, the inherent ambiguity regarding the whereabouts of the security was a feature that not just public actors but also private profit-oriented actors used to their advantage. It was part of their business model.

Third, the inherent ambiguity of repos is connected to what eventually led to the bankruptcy of Lehman Brothers. To hide the extent to which it was leveraged, Lehman used so-called "Repo 105" and "Repo 108" devices in their books. These accounted for its repo transactions as "sales" (effectively as in our hypothetical Figure 4) and dropped the credit nature of the transaction. This practice started in 2001 but was used much more extensively in 2007 and 2008 as the bank entered into financial strains (McDonald 2015, 90–92). Repo 105 and 108 made use of a loophole in the Generally Accepted Accounting Practices, which allowed Lehman to book the repo transactions as a sale rather than a loan as long as it put up at least 102% of the value of the loan in collateral (Jones and Presley 2013, 57). Hence, Lehman's practice was to hide where the security "was" by pretending that it had permanently left their balance sheet and that there was no obligation to buy it back. When this practice could no longer be maintained and the hidden credit positions reappeared, Lehman's bankruptcy set in.

Regulators have repeatedly sought to tackle the problem and reduce the inherent ambiguity of repos. For instance, after the bankruptcies of Drysdale Government Securities and Lombard-Wall in 1982, a court attempted to provide legal certainty about repos and properly define where the underlying securities were and who owned them. The bankruptcy court announced that repos would be treated as secured loans, not as outright transactions. This implied that the creditor's right to liquidate the securities was now in principle subject to the "automatic stay" of bankruptcy law. It was not well received by repo practitioners who saw their business model endangered. The solution found—heavily influenced by the lobbying of Federal Reserve Chairman Paul Volcker—was that repos were exempted from bankruptcy law. The law was passed a couple of years later (Garbade 2006, 35).

Another change of repo regulation materialised after the Lehman bankruptcy—the introduction of "*encumbrance*" (CGFS 2013). In line with the introduction of the Basel III framework and its Pillar 3 disclosure requirements (BCBS 2018, 8, footnote 12), the regulatory treatment now foresees that the security used as collateral in a repo transaction does not leave the balance sheet of the repo borrower. Instead, the asset swap on the repo borrower's balance sheet is taken to mean that the security becomes "*encumbered*" in a repo transaction (Berthonnaud et al. 2021, 8).

In June 2014, the US Financial Accounting Standards Board (FASB) implemented this regulation by issuing new accounting rules for repo transactions—see Accounting Standards Update (ASU 2014-11), subsection on "Transfers and Servicing" (Topic 860). Accordingly, all repo-to-maturity transactions, which constitute the majority of US repo transactions, have to be treated as secured borrowings in which the securities remain on the balance sheet of the repo borrower (Salerno, Ruddy, and Rajan 2016; Klein 2022). The EU implemented the Basel III framework by means of Directive 2013/36/EU5, the Capital Requirements Directive (CRD), and Regulation (EU) No 575/20136, the Capital Requirements Regulation (CRR). Article 100 of the CRR introduces reporting requirements on "repurchase agreements, securities lending and all forms of encumbrance of assets" (Berthonnaud et al. 2021, 8). Moreover, security encumbrance has been codified via the ECB guideline 2016/2249 on the legal framework for accounting and financial reporting in the European System of Central Banks (ECB/2016/34), where it is mentioned that the securities sold under repo agreements shall be treated as if the assets in question were still part of the portfolio from which they were sold.

In our view, the assessment that the security used as collateral gets *encumbered* during the repo transaction is the latest regulatory approach to grasp the underlying balance sheet mechanics expressed in Figures 5 and 6. In that sense, it is yet another attempt to manage the inherent ambiguity of repos. The Lehman bankruptcy made it urgent to provide a better definition of the whereabouts of the security during the maturity period. However, it did not change anything fundamentally about the underlying structure of repos. It is a new way of thinking about it, which will likely stay with us for some time until it is replaced by the next attempt to cope with repos' inherent ambiguity.

In sum, our proposed notation style has the advantage of depicting consistently on-balance-sheet what happens with regard to the creation of the repo instruments, what the origin is of the hierarchically higher monetary instrument, and where the security is positioned that functions as collateral for the transaction. In this sense, it overcomes the discrepancy of the legal and accounting treatment of repos. If we intend to systematically incorporate repo transactions into webs of balance sheets with interlocking instruments, we need to be able to be specific about the on-balance-sheet position of all three instruments that are part of this operation. At the same time, it makes the inherent ambiguity explicit that comes along with the off-balance-sheet nature of the transaction for the repo lender. The repo collateral is the repo lender's asset but never formally touches the balance sheet.

### 2.3 The collateral framework on the repo lender's balance sheet

While the on-balance-sheet representation of horizontal and vertical repos via two quadruple-entry-consistent financial transactions clarifies the whereabouts of the security posted as collateral during the maturity period, it does not give any information about the specific securities eligible to be used as collateral in the repo operation. The visualisations in Figure 5 and 6 are transactional balance sheets that focus on *micro-level flows*. From a *macro-financial* perspective, it is also of interest to be able to depict static balance sheets as stocks that indicate which specific securities can be used as collateral to acquire a credit money instrument via repos.

Figure 7 presents a notation style for such a macro-financial stock perspective. Our example shows a vertical repo between a central bank ("repo lender") and a bank ("repo borrower"). The bank issues repos as its liability which the central bank holds as asset. We specify which securities are eligible for repo on the balance sheet of the central bank—here Security X and Y—because it is ultimately the power of the repo lender to determine which securities it accepts as collateral, even though the security does not formally touch the repo lender's balance sheet. On the repo borrower's balance sheet, we distinguish the securities held outright into those that are eligible for repos and those that are non-eligible. Moreover, we indicate securities that already are used as collateral in a repo transaction, which as to contemporary regulations are to be classified as encumbered and which *could* be recorded as off-balance-sheet positions of the central bank.

**Figure 7—Determining collateral eligibility via the repo lender’s balance sheet**

Central Bank (repo lender)	
Securities held outright Repos Against eligible securities Other loans and bonds	Reserves
	Liquidity insurance (to banks)
Bank (repo borrower)	
Reserves Interbank lending Securities held outright Eligible securities for repo Non-eligible securities for repo Securities in repo transactions Other loans and bonds	Deposits Interbank borrowing Repos (with central bank)
Liquidity insurance (at central bank)	<i>Equity capital</i>

The depiction in Figure 7 shows how the securities devised as eligible for repo can be readily converted into hierarchically higher money, here central bank reserves. This conveys why eligible securities can be considered a “secondary reserve”. Changing the eligibility criteria for repo collateral thus means granting or withdrawing secondary reserve-status to the involved securities. This has major implications for both the institutions that hold them as assets (here the bank) as well as the institutions that issue them as their liabilities. The issuers of the security do not feature in our visualisation in Figure 7 but could be added in a more comprehensive “monetary architecture” visualisation (Murau 2020). If an institution’s debt issued as a liability qualifies as eligible repo collateral, the demand for this instrument will be significantly higher and the interest that the institution has to pay for it will be significantly lower.

The repo lender is in the position to stipulate collateral eligibility either ad hoc or in a more formalised way, for instance via a *collateral framework*. Collateral frameworks are used by central banks and other repo lenders to define the set of eligible collateral through which repo borrowers can engage in transactions with them, as well as the haircut imposed on the security posted (Nyborg 2017; Vestergaard and Gabor 2022). The design of a collateral framework has a paramount influence on the market liquidity of the securities included in it—i.e., the ease with which they are traded—as well as the funding liquidity of the repo borrowers—i.e., the ease with which they can obtain funding (cf. Brunnermeier and Pedersen 2009). Repo lenders can modify the collateral framework upon their discretion. A tightening of the collateral framework implies a reduction of “elasticity space” (Murau 2020) on both counterparties’ balance sheets, whereas a widening of the collateral framework expands the balance sheets’ elasticity space. In the case of vertical repos, the hierarchically higher institution can impose effective constraints on credit money creation on its balance sheet. In the case of a horizontal repo, the repo lender can

influence the ease of obtaining pre-existing credit money instruments. Our proposed notation style allows making collateral frameworks—which usually are obscured by opacity (Nyborg 2017)—explicit and transparent.

To substantiate the merits of our proposed notation style of vertical and horizontal repos with encumbered securities on the balance sheet of the repo borrower and the collateral framework on the balance sheet of the repo lender, we apply it in the subsequent sections on two quintessential cases that are of profound relevance for the monetary architecture of the Euro area: the Eurosystem’s monetary policy operations that are based on vertical repos, as well as the secured interbank lending market of the Euro area, which uses horizontal repos both for General and Special Collateral Repos. In particular, we intend to show that the vertical repo mechanism in the first case leads to the creation of new hierarchically higher money, whereas the horizontal repo mechanism in the second case does not. The two case studies are followed by a discussion of our findings and a conclusion that shows avenues for future research.

### **3. Vertical repos as monetary policy instruments in the Euro area**

#### *3.1 Eurosystem monetary policy operations on-balance-sheet*

Vertical repos play a central role for monetary policy in the Eurosystem. In the original monetary policy framework, repos were foreseen as the primary mechanism to implement monetary policy. The main alternative—outright purchases of securities—was only attributed a subordinate role (Galvenius and Mercier 2011, 148). The National Central Banks (NCBs) are the hierarchically higher balance sheets chosen to carry out the monetary policy operations set by the ECB Governing Council and thus create reserves—i.e. provide liquidity—for “their” banking system in accordance with ECB rules and the capital key (Bindseil 2014). The ECB balance sheet was not originally operationalized for monetary policy activities (Murau and Giordano 2023).

Table 1 provides a systematic overview on the role of vertical repos in the original monetary policy framework. *Open market operations* (OMOs) are monetary policy operations carried out at the initiative of the Eurosystem. The regular OMOs comprise the Main Refinancing Operations (MRO) and the Longer-Term Refinancing Operations (LTROs). Fine-tuning operations and structural operations are extemporary OMOs. The *standing facilities* can be used upon the initiative of banks to absorb and provide liquidity. The marginal lending facility (MLF) allows them to borrow reserves overnight, whilst the Deposit Facility allows bank to deposit remunerated reserves at the Eurosystem. For both OMOs and standing facilities repos and outright purchases are the main transaction types.

**Table 1—The original monetary policy framework of the Eurosystem**

Monetary policy operation	Types of transactions		Maturity	Frequency	Procedure
	Liquidity providing	Liquidity absorbing			
<b>OPEN MARKET OPERATIONS</b>					
<b>Main refinancing operations (MRO)</b>	* Repo	–	* 2 weeks	* Weekly	* Standard tenders
<b>Longer-term refinancing operations (LTROs)</b>	* Repo	–	* 3 months	* Monthly	* Standard tenders
<b>Fine-tuning operations</b>	* Repo * FX swaps	* Repo * FX swaps * Collection of fixed-term deposits	* Non-standardized	* Non-regular	* Quick tenders * Bilateral procedures
	* Outright purchases	* Outright sales	–	* Non-regular	* Bilateral procedures
<b>Structural operations</b>	* Repo	* Issuance of debt certificates	* Standardized/ non-standardized	* Regular + non-regular	* Standard tenders
	* Outright purchases	* Outright sales	–	* Non-regular	* Bilateral procedures
<b>STANDING FACILITIES</b>					
<b>Marginal Lending Facility (MLF)</b>	* Repo	–	* Overnight	* Access at the discretion of counterparties	
<b>Deposit facility (DF)</b>	–	* Deposit	* Overnight	* Access at the discretion of counterparties	

Source: ECB (2000, 7).

With the advent of unconventional monetary policy, new types of repo operations and outright asset purchasing programmes (APPs) were added to the original monetary policy framework. [Table 2](#) presents an overview on the different rounds of repo operations, starting with the first Targeted Longer-Term Refinancing Operations (TLTROs) in 2014, and the APPs in 2015.

**Table 2— Unconventional Monetary Policy Programmes of the Eurosystem (as of 2024)**

<b>NON-REGULAR REPO OPERATIONS</b>					
Monetary policy operation	Types of transactions		Maturity	Frequency	Procedure
	Liquidity providing	Liquidity absorbing			
Targeted longer-term refinancing operations (TLTRO) I	* Repo	-	* 4 years	* Quarterly	* Standard tenders
TLTRO II	* Repo	-	* 4 years	* Quarterly	* Standard tenders
TLTRO III	* Repo	-	* 3 years	* Quarterly	* Standard tenders
Bridge LTRO	* Repo	-	* 1 year	* Weekly	* Standard tenders
Pandemic Emergency Longer-Term Refinancing Operations (PELTRO)	* Repo	-	* 1 year	* Quarterly	* Standard tenders
<b>NON-REGULAR TEMPORARY ASSET PURCHASING PROGRAMMES</b>					
Monetary policy operation	Balance sheet carrying out the operation		Maturity	Frequency	Procedure
Corporate Sector Purchase Programme (CSPP)	Six NCBs do all the buying; risk-sharing according to capital key *		* Non-standardized	* Non-regular	* Bilateral procedures
Public Sector Purchase Programme (PSPP)	All Eurosystem NCBs buy the securities issued by their respective governments and bear all the risk; capital key is upper limit		* Non-standardized	* Non-regular	* Bilateral procedures
Asset-Backed Securities Purchase Programme (ABSPP)	Only those NCBs that act as internal asset managers conduct the purchases <sup>†</sup>		* Non-standardized	* Non-regular	* Bilateral procedures
Covered Bond Purchase Programme (CBPP)	All Eurosystem NCBs buy according to ECB's capital key		* Non-standardized	* Non-regular	* Bilateral procedures
<b>NON-REGULAR TEMPORARY ASSET PURCHASING PROGRAMMES – COVID Pandemic Special</b>					
Pandemic Emergency Purchase Programme (PEPP)	All Eurosystem NCBs buy the securities issued by their respective governments and bear all the risk; divergence from capital key is possible		* Non-standardized	* Non-regular	* Bilateral procedures

Sources: ECB (2020b; 2020d; 2022a; 2022b; 2022c)

\* The NCBs conducting the purchases are (1) the Nationale Bank van België/Banque Nationale de Belgique, (2) the Deutsche Bundesbank, (3) the Banco de España, (4) the Banca d'Italia, (5) the Banque de France, and (6) the Suomen Pankki – Finlands Bank.

<sup>†</sup> The national central bank carrying out the operations depends on the country of the ABSs' underlying collateral. In terms of the geographical coverage, the following allocation applies: (1) Banque Nationale de Belgique: Belgium; (2) Deutsche Bundesbank: Germany; (3) Banco de España: Spain; (4) Banque de France: Finland, France, Ireland, Luxembourg and Portugal; (5) Banca d'Italia: Italy; and (6) De Nederlandsche Bank: Netherlands.



From the perspective of balance sheet mechanics, there is no difference if a monetary policy operation is carried out upon the initiative of the central bank (as in the case of OMOs) or the banks (as in the case of standing facilities). It does differ, however, if the monetary policy operation is implemented via a repo or an outright transaction.

Figure 8 depicts the monetary policy operations that are carried out as a vertical repo transaction. In line with our proposed notation style, a Euro area bank receives reserves as asset which the NCB creates on the spot. In return, the bank creates a repo as its liability which the NCB receives as an asset. The security used as repo collateral does not leave the balance sheet of the Euro Area Bank but is shifted from the “held outright” position to “encumbered” status. The NCB could record the securities received as an off-balance-sheet position.

**Figure 8—Monetary policy operation btw. NCB and bank as a vertical repo**

NCB		Euro Area Bank	
+ Repo	+ Reserves	+ Reserves	+ Repo
NCB's Off-Balance-Sheet Positions			
+ Security	+ Security due	- Security	+ Security due

The empirical data that corresponds to this transaction can be retrieved from the official documentation of the Eurosystem’s disaggregated financial statements.<sup>‡</sup> The NCB’s repo lending is recorded in section 5 called “Lending to euro area credit institutions related to monetary policy operations denominated in euro”; as sub-categories, this section encompasses MROs, LTROs, MLF, fine tuning reverse operations, and credits related to margin calls. Off-balance-sheet positions are not officially recorded.

Figure 9 depicts the outright transaction. The NCB creates reserves as its liability and obtains a security. For the Euro area bank, the transaction is an asset swap of reserves against security.

**Figure 9—Monetary policy operation btw. NCB and bank as outright purchase**

NCB		Euro Area Bank	
+ Security	+ Reserves	+ Reserves	- Security

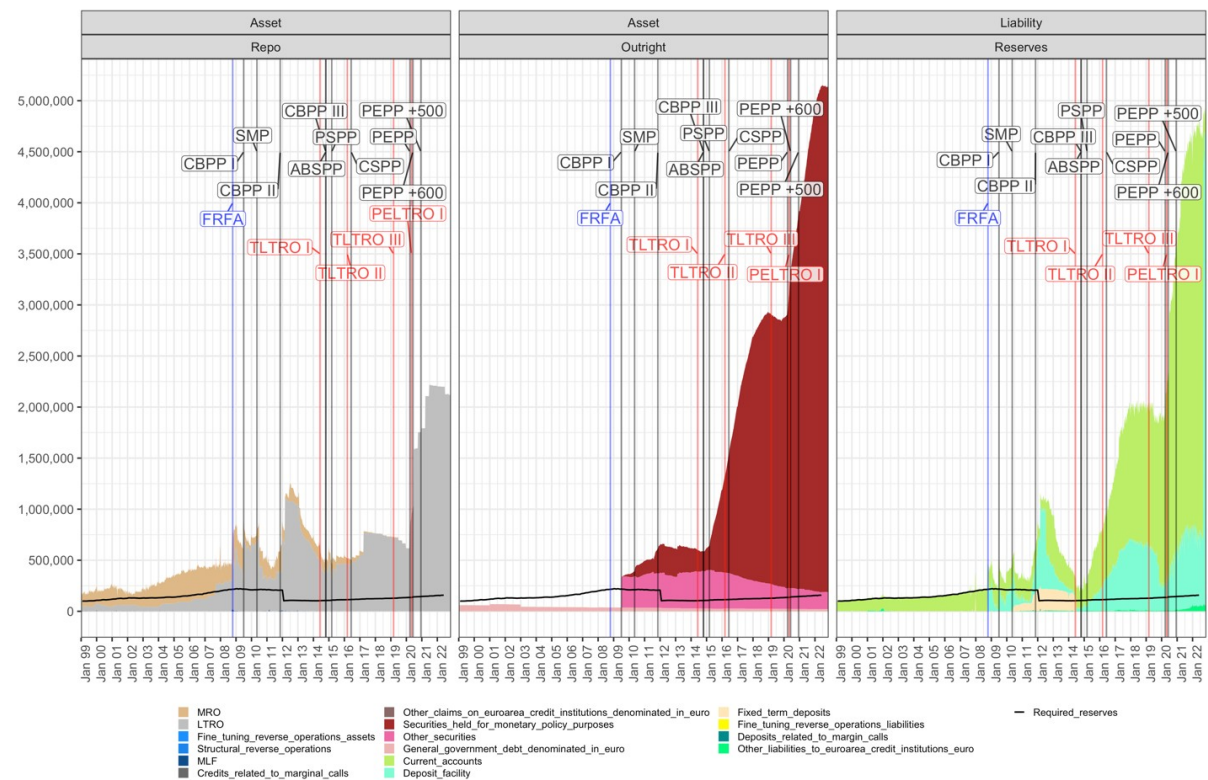
In the official documentation of the Eurosystem’s disaggregated balance sheet, the security received by the NCB is recorded under “assets” in section 7 called “Securities of euro area residents denominated in euro”, which has two sub-categories: “securities held for monetary policy purposes” and “other purposes”.

<sup>‡</sup> <https://www.ecb.europa.eu/press/pr/wfs/dis/html/index.en.html>

The reserves created by the NCB in either repo or outright transactions are recorded under “liabilities” in section 2 called “Liabilities to euro area credit institutions related to monetary policy operations denominated in euro”. As sub-categories, this section primarily comprises “Current accounts (covering the minimum reserve system)”, which are not remunerated, as well as the “deposit facility”, which is remunerated at a set rate. Other, less important reserve types in this section are “fixed-term deposits”, “fine-tuning reverse operations”, as well as “deposits related to margin calls”. Section 3 contains “Other liabilities to euro area credit institutions denominated in euro”. The reserves created through repos or outright purchases primarily appear as reserves in the current account or in the deposit facility. Which type of reserves is created does not correspond to a specific programme but is decided on a case-by-case basis depending on what the Eurosystem offers and what the bank chooses (ECB 2017).

Figure 10 presents the volumes of monetary policy operations to be found in the official documentation from 1999 to 2022. Panel 1 shows the repo transactions, Panel 2 the outright purchases. The individual entries fit to the categories of operations introduced in Tables 1 and 2. Panel 3 depicts the volume of central bank liabilities to Euro area banks, subdivided into the different types of reserves. The black line plots the level of required reserves.

**Figure 10—Eurosystem Aggregated Financial Statement, weekly balance, in mn EUR (1999-2022)**



Notes: Euro area changing composition, only items denominated in euro. LTROs include all LTROs and TLTROs.

Source: Elaborations based on the ECB's Internal Liquidity Management (ECB 2024).

The three panels display the relative empirical importance of vertical repos in the history of the European Monetary Union and their impact on central bank money creation. The data gives evidence of how vertical repos were the main mechanism for monetary policy implementation of the Eurosystem prior to the 2007-9 Global Financial Crisis. In this period, the Eurosystem had a “lean” balance sheet. Central bank reserves were almost exclusively kept in the current accounts and corresponded to the level of required reserves. Outright purchases of securities merely played a subordinate role, as originally intended.

The sea change on the Eurosystem balance sheet composition started on 6 October 2008 when the Eurosystem—under the impression of the Lehman Brothers bankruptcy on 19 September 2008—shifted its policy in the MROs to “fixed-rate full allotment” (FRFA). Rather than auctioning an *ex ante* defined volume of central bank reserves, Euro area banks could now use vertical repos to borrow central bank liquidity to an unlimited extent (Cour-Thimann and Winkler 2013, 11). As a result, repo volumes spiked and banks started systematically using the deposit facility which caused the emergence of excess reserves. Soon after, the relative importance of repos as monetary policy instrument began to shrink. In July 2009, the first Covered Bond Purchase Programme (CBPP-1) ushered in a new era of outright purchases (Beirne et al. 2011). Paralleling the Fed's *Dealer of Last Resort* operations at the time (Mehrling 2011), the securities bought under CBPP-1 are not classified as “securities held for monetary policy purposes” but as “other securities”. In 2014, the Eurosystem's APPs commenced. The most significant impact on the Eurosystem balance sheet had the purchases of Asset-backed Securities (ABSs) with the ABSPP, which began in November 2014, as well as the Pandemic Emergency Purchase Programme, which started in March 2020 (Banca d'Italia 2022). Both programmes gave rise to a massive increase of central bank reserve creation that impacted both the current account and the deposit facility.

To understand the spikes in vertical repos, as they happened for instance in 2012, 2017, and 2020, we have to look at the Eurosystem's *collateral framework*.

### 3.2 The Eurosystem's collateral framework and its transformation

The Eurosystem's collateral framework determines which securities banks can post as collateral when they want to engage in vertical repos with “their” NCB to borrow reserves from it and, vice versa, which securities the NCB accepts as assets on its hypothetical off-balance-sheet positions. Hence, the collateral framework grants the Eurosystem discretion to influence the elasticity space on both the NCBs' and the banks' balance sheet. It also plays a crucial role in influencing the market liquidity of securities by determining whether they have a central bank backstop.

The Eurosystem's collateral framework is the sum of its “General Collateral Framework”, which determines collateral eligibility in normal times, and the “Temporary Collateral Framework”, which can be changed on short notice to react to

crisis situations and overrules the general one (Eberl and Weber 2014; Bindseil et al. 2017). The collateral framework not only applies to securities in standard and non-standard repo transactions but also to securities purchased outright in standard and non-standard operations as both OMOs and APPs have so far followed the stipulations of the collateral framework, even though this is not a strict necessity (Weber 2016). Since the European Monetary Union became effective, the ECB Governing Council has subjected the Eurosystem’s collateral framework to a tremendous transformation, pointing to its significance as a *de facto* policy tool.

As the result of the preparatory work at the European Monetary Institute (EMI) in the mid-1990s, the Eurosystem adopted a *two-tier collateral framework* in 1998 which was effective when the European monetary union became operational in 1999. Accordingly, “Tier 1 assets” comprised debt instruments with harmonised eligibility criteria across the monetary union and pooled risk among all members of the Eurosystem. By contrast, “Tier 2 assets” were individually proposed by the NCBs, which solely bore the risk, and were connected to the legacy collateral framework dating back to the time before European monetary unification (Galvenius and Mercier 2011, 179–81).

Figure 11 depicts this original two-tier framework on-balance-sheet, integrated in the hierarchical relationship between a Euro area NCB and one of the banks in its inner-Euro area jurisdiction. The NCB issues reserves as liabilities, which the banks hold as assets, and provides liquidity insurance in the form of the Marginal Lending Facility as a contingent liability, which the banks hold as contingent asset. The NCB balance sheet comprises both securities held outright as well as repos, for which the list eligible collateral is stipulated. The bank has posted this eligible collateral in vertical repo transaction with the NCB and therefore has tier 1 and tier 2 assets in encumbered status. Tier 1 securities comprise especially treasury securities. Tier 2 assets are more diverse and entailed also more unusual instruments such as equities. of

**Figure 11—NCB and banks in Euro area with two-tiered collateral framework (as of 1999)**

NCB	
FX reserves Securities held outright Treasury securities Other securities Repos Against Tier 1 assets (esp. treasury sec.s) Tier 2 assets (others) Other loans and bonds	Reserves Required reserves Notes  Liquidity insurance MLF (to banks)
Euro Area Banks	
Reserves	Deposits

Interbank lending Securities held outright Eligible securities for repo (Tier 1+2) Non-eligible securities for repo Securities in repo transactions Loans	Interbank borrowing Covered bonds Repos (with NCB)
Liquidity insurance MLF (at NCB)	<i>Equity capital</i>

As the two-tier collateral framework had only been seen as a temporary solution, the Eurosystem soon started working on harmonising the collateral framework within the monetary union (Van 't Klooster 2021, Ch. 4-5). The goal was the introduction of a “Single List”, in which the distinction of tier 1 and tier 2 assets was replaced with a distinction of “marketable” and “non-marketable” assets. While marketable assets comprised what previously were tier 1 assets, non-marketable assets were defined as credit claims such as bank loans and retail mortgage-backed debt instruments (RMDBs) (Eberl and Weber 2014, 9). In 2003, the Governing Council approved the move towards a “Single List” and its introduction in two steps. In May 2005, it completed the first step which involved the removal of equities as acceptable collateral, refining the eligibility criteria, and introducing certain euro-denominated securities issued outside of the European Economic Area (ECB 2006b). In 2007, as the level of segmentation in financial markets has subsided, the move to a “Single List” was completed. NCBs were no longer able to choose eligible collateral for their monetary policy transactions as this became a function exclusively exercised by the ECB (Cheun, von Koppen-Mertes, and Weller 2009; Bindseil et al. 2017).

As part of the 2005 reforms, the Eurosystem introduced a market-based approach for government bonds in their collateral framework (Orphanides 2017; 2018). According to the new rules, a security required a minimum credit standard of “single A”, which meant “A-” by Fitch or Standard & Poor’s, or “A3” by Moody’s, to be eligible for repo transactions with the Eurosystem (ECB 2006a, 41). As a consequence, this reform made the eligibility of liquidity insurance dependent on market sentiment and the assessment of credit rating agencies, instead of generally accepting all treasury securities independently of the market situation. Orphanides (2017, 2018) explains this as an attempt of the ECB to enforce the Stability and Growth Pact (SGP). An alternative interpretation is a pure scientisation of monetary policy (Marcussen 2009). Van 't Klooster (2022) argues that the primary reason was to depoliticise the choice of collateral in order to avoid contestation of the ECB’s legitimacy.

Figure 12 depicts the relationship between the NCB and banks with the changed collateral framework after the introduction of the Single List. The pool of eligible collateral consisted of at least “A-”-rated central government securities, regional government securities), unsecured bank bonds, covered bonds, corporate bonds, asset-backed securities (ABSs), and other marketable assets. The changes had reduced the available elasticity space on the NCBs’ and banks’ balance sheets.

**Figure 12—NCB and banks in Euro area with Single List collateral framework (as of June 2007)**

NCB	
FX reserves Securities held outright Treasury securities Other securities Repos Against <i>Treasury securities (rated at least A-)</i> <i>Covered bonds (rated at least A-)</i> <i>ABS (rated at least A-)</i> <i>Other securities (rated at least A-)</i> Other loans and bonds	Reserves Required reserves Notes
	Liquidity insurance MLF (to banks)
Banks	
Reserves Interbank lending Securities held outright Eligible securities for repo Non-eligible securities for repo Securities in repo transactions Loans	Deposits Interbank borrowing Covered bonds Repos (with NCB)
Liquidity insurance MLF (at NCB)	<i>Equity capital</i>

Whatever the intention was of the shift to a market-based collateral framework, this decision backfired during the GFC and the Eurocrisis (Van 't Klooster 2021, Ch. 6). The market-based collateral framework had a procyclical effect and opened the gate for self-fulfilling prophecies: if markets started to doubt the quality of a sovereign bond, the Eurosystem would withdraw its support for it (Vestergaard and Gabor 2022). Therefore, banks that wanted to use the collateral of contraction-affected treasuries were not able to draw on the liquidity insurance of the Eurosystem. Repeatedly, the Eurosystem saw itself forced to lower the standards in its collateral framework by changing the regulations in the temporary framework. Some of these changes were later adopted in the General Collateral Framework.

The first round of crisis-driven adjustments to the collateral framework took place shortly after the collapse of Lehman Brothers on 15 September 2008, when the Eurosystem repeatedly saw itself forced to increase elasticity within the Euro area's monetary architecture. On 22 October 2008, the Eurosystem lowered the credit threshold for marketable and non-marketable assets from "A-" to "BBB-" but kept the required threshold for ABSs at "A-". Moreover, it started accepting certificates of deposits, fixed-term deposits, as well as other subordinate marketable debt instruments. On 14 November 2008, the Eurosystem also started accepting marketable debt instruments that were not denominated in EUR but in another currency if the issuer was established in the European Economic Area (EEA). While

these changes were merely temporary at first, some of them were made permanent later. For instance, in April 2010, the Eurosystem decided to keep the minimum threshold at “BBB-” (ECB 2013).

A second round of crisis-driven reforms to the collateral framework happened during the Eurocrisis. On 8 December 2011, the Eurosystem decided to also accept performing credit claims such as bank loans and to reduce the threshold for certain ABSs to “BBB-”. Effectively, these reforms divided ABSs into different classes that were backed by different underlying securities. For instance, first-class ABSs comprised commercial mortgages, auto loans, leasing and customer finance; second-class ABSs comprised residential mortgages or loans to SMEs; and third-class ABSs comprised e.g. credit card receivables. The required threshold for second-class ABSs was lowered from “AAA” to “A-” in April 2012 and to “BBB-” in July 2012 when the Eurocrisis spread to Spain and Italy. The threshold for first-class ABSs was lowered directly from “AAA” to “BBB-” also in July 2012. The threshold for third-class ABSs was decreased in July 2014 (Wolff 2014).

The third round of crisis-driven reforms materialized during the COVID-19 crisis in 2020 (De Guindos and Schnabel 2020; Mooij 2022). To increase the elasticity within the Euro area’s monetary architecture, the ECB announced on 7 April 2020 that it would expand the volume of non-marketable assets that are acceptable as collateral and temporarily include additional credit claims (ACC) into the collateral framework. The expansion comprised loans with lower credit quality, loans to other types of debtors that are not accepted in the ECB’s general framework, and foreign-currency loans (ECB 2020a). As a second important measure, the ECB increased the concentration limit for unsecured bank bonds (UBBs) from 2.5% to 10%. UBBs are important because they represent unsecured debt instruments through which financial institutions can obtain funding. As a third reaction, the ECB decided to grant a waiver to Greek bonds, which again became eligible for Eurosystem’s transactions (De Guindos and Schnabel 2020). On 22 April 2020, the ECB decided that assets which fulfilled the minimum credit ratings on 7 April 2020 would remain eligible as collateral until September 2021 even if their rating would be downgraded (ECB 2020c).

Taking on board those three rounds of crisis-driven transformations, [Figure 13](#) shows the collateral framework as it looks today. The depiction shows the broadening of the collateral framework to clarify how the conditions for receiving elasticity from the central bank were eased. Moreover, it reflects the increase of securities held outright by the NCB and points to the emergence of structural excess reserves from 2009 onwards. This visualisation underpins the extent to which multiple credit instruments in the monetary architecture now have de facto central bank backstops.

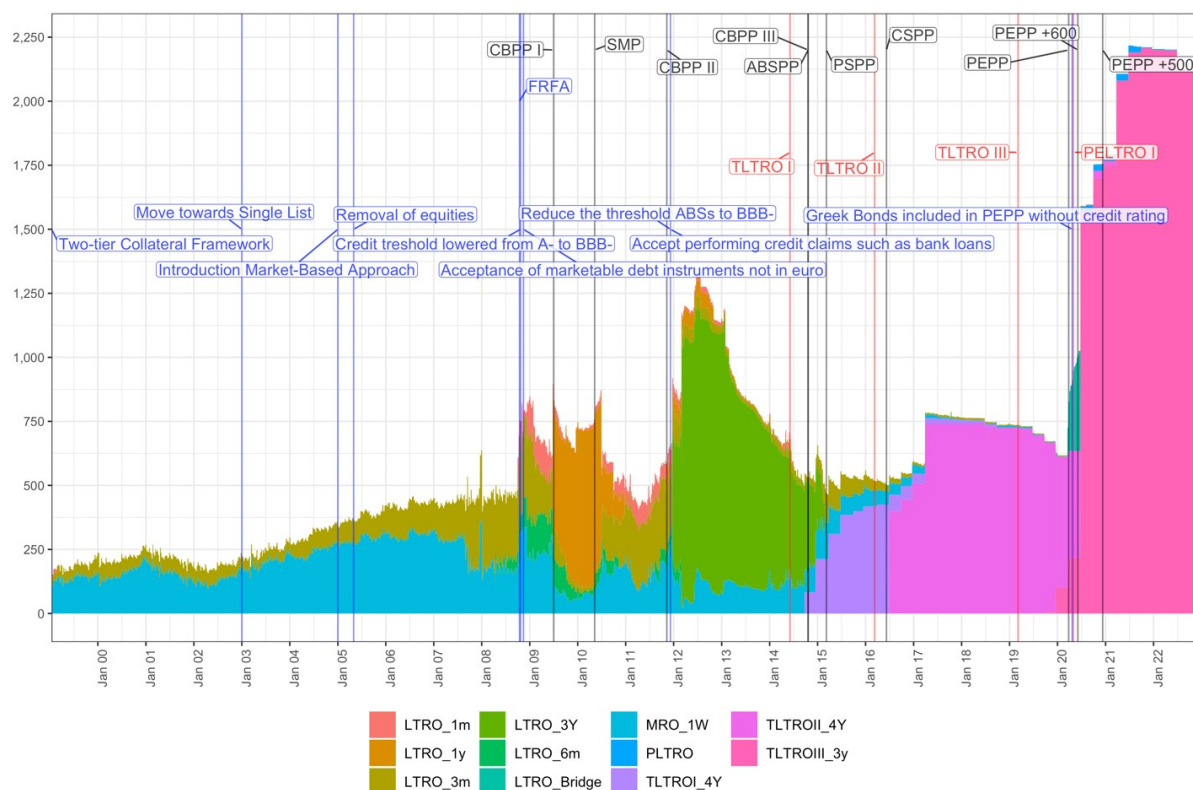
**Figure 13—NCB and banks in Euro area with crisis-transformed collateral framework in 2024**

NCB	
FX reserves Securities held outright Treasury securities Covered bonds Other securities Repos Against <i>Treasury securities (rated at least BB)</i> <i>Greek Waiver</i> <i>Covered bonds (rated at least BB)</i> <i>1<sup>st</sup>, 2<sup>nd</sup> &amp; 3<sup>rd</sup> tier ABS (rated at least BB+)</i> <i>Certificates of Deposits</i> <i>Performing bank loans</i> <i>Additional Credit Claims</i> <i>Unsecured Bank Bonds</i> <i>Other securities (rated at least BB)</i> Other loans and bonds	Reserves Required reserves Excess reserves Notes
	Liquidity insurance MLF (to banks)
Banks	
Reserves Interbank lending Securities held outright Eligible securities for repo Non-eligible securities for repo Securities in repo transactions Loans	Deposits Interbank borrowing Covered bonds Repos (with NCB)
Liquidity insurance MLF (at NCB)	<i>Equity capital</i>

Figure 14 depicts the volume of monetary policy operations that the Eurosystem has carried out through repo (panel 2 of Figure 8) in a more fine-grained way. It integrates the individual repo programmes and indicates the key dates in which the collateral framework was changed as well as the dates of the announcement of the APPs. The volume of repos outstanding was determined both by the introduction of the various programmes coupled with the changes in the collateral framework. An expansion of the securities accepted as collateral—by including new ones or by reducing credit rating requirements—allows for a wider access to the Eurosystem’s collateralised operations and accepting more types of collateral as the NCB’s hypothetical off-balance-sheet position. For example, the large increase in 2020 through the TLTROs III was caused by the recalibrated programme as well as by the collateral easing enacted by the Eurosystem. Such measures comprise the expansion of ACCs including loans covered by public guarantee schemes, the use of non-high-quality liquid assets, and the use of Greek bonds to acquire the funding. Estimates by the ECB suggest that around 240 billion EUR of the use of TLTRO III was possible due to the temporary collateral easing measures that were valid until June 2022 (ECB 2021).



**Figure 14—Eurosystem Refinancing Programmes (LTROs and TLTROs), in bn EUR (1999-2022)**



Source: Elaborations based on Leipzig Universität and ECB<sup>§</sup>

In sum, our proposed methodology for representing vertical repos on-balance-sheet gives a systematic understanding of the use of repos as monetary policy tool by the Eurosystem and helps overcome their inherent ambiguity. First, the methodology shows how vertical repos lead to money creation on the higher-ranking balance sheet, here in the form of central bank reserves on the NCBs’ balance sheets. Second, the methodology clarifies how repo borrowers’ IOUs are held as assets on the repo lenders’ balance sheets whilst the securities pledged as collateral are not swapped but remain on the borrowers’ balance sheets in an encumbered status; on the repo lender’s side, they can at best be recorded as off-balance-sheet position. Third, the methodology allows to represent the collateral eligibility criteria as stipulations on the repo lender’s balance sheet. Since the introduction of “fixed-rate full allotment” has kickstarted an era of excess reserves, the collateral framework has become a key policy tool for steering central bank money creation. While it was primarily directed at repo transactions, the collateral framework also affects outright purchases, which have dramatically increased in volumes through CBPP-1, ABSPP, and PEPP.

<sup>§</sup> [https://www.ecb.europa.eu/mopo/implement/omo/html/top\\_history.en.html](https://www.ecb.europa.eu/mopo/implement/omo/html/top_history.en.html).

## 4. Horizontal repos in the Euro area’s interbank market

### 4.1 Secured interbank borrowing and lending

Horizontal repos play a central role for interbank borrowing and lending in the Euro area. For instance, horizontal repos are the balance sheet mechanism used in the secured interbank market and thus constitute an alternative to unsecured interbank borrowing and lending.

Figure 15 depicts a horizontal repo as a bilateral or over-the-counter transaction between two Euro area banks, Bank A and Bank B. Bank B creates a repo as liability which Bank A holds as asset. Bank A, in turn, transfers central bank reserves which it previously possessed. As Bank A carries out an asset swap and does not create a new liability itself, the balance sheet mechanics do not involve swap of IOUs and consequently no new money creation. The encumbrance of the security on Bank B’s balance sheet and the off-balance-sheet recording of Bank A’s balance sheet is the same as in the case of vertical repos.

**Figure 15—Secured interbank lending via an over-the-counter repo**

Euro Area Bank A (repo lender)		Euro Area Bank B (repo borrower)	
– Reserves		+ Reserves	+ Repo
+ Repo			
Banks A's Off-Balance-Sheet Positions			
+ Security	+ Security due	– Security	
		+ Security due	

Figure 16 depicts the alternative case when both banks transact on the unsecured interbank market. Bank A transfers the reserves to Bank B and receives “interbank lending” as an asset, whereas Bank B incurs a liability, “interbank borrowing”.

**Figure 16—Unsecured interbank lending**

Euro Area Bank A (lender)		Euro Area Bank B (borrower)	
– Reserves		+ Reserves	+ Interbank borrowing
+ Interbank lending			

A horizontal repo that corresponds to the mechanics displayed in Figure 14 can be either a General Collateral Repo (GC repo) or a Special Collateral Repo (SC repo).

GC repos are repo transactions based on a basket of securities that are equally acceptable as collateral at the same repo rate. When pledging a security as collateral for a repo, it does not matter which specific security it is; it is only relevant that it belongs to a category of securities that are part of the defined basket. The repo borrower can pledge any security that has been defined as eligible for GC repos and included in a collateral basket pool. Securities in that basket pool are all

treated as equivalent from a risk management perspective and banks can use them on a non-discriminatory basis. As the repo lender does not exactly know which specific security from the collateral pool is pledged, it is possible to return a different but equivalent security. Therefore, the asset to be returned does not have a specific ISIN code (International Securities Identification Number). GC repo transactions take place at a market repo rate that is decided in advance (D'Amico, Fan, and Kitsul 2018).

SC repos, by contrast, are repo transactions concluded to obtain a specific security. This may be necessary if a Bank A has previously entered into a futures contract and at maturity needs to deliver a specific security. In an SC repo, the collateral is chosen individually and is clearly identifiable via a specific ISIN code. The distinction between the legal and the accounting perspective is especially relevant in this case: Bank A needs to acquire the legal ownership over the security, but in accounting terms it nevertheless remains encumbered on Bank B's balance sheet. The SC repo comes with a legal obligation to return exactly the borrowed security, an equivalent security would not be acceptable. SC repos involve paying a special rate, which is influenced by how much sought after the asset is (Corradin and Maddaloni 2017).

The price for an SC repo is usually lower than for a GC repo. This difference points to the demand for particular collateral which necessarily trades at lower rates. Such special role of certain securities is captured in the degree of "specialness" of the security posted as collateral, which is computed as the spread between GC and SC rates. A high degree of specialness implies higher demand or lower relative supply of the security. Research on Euro area repo markets has shown that the degree of a security's specialness is not primarily affected by changes in the collateral framework but through unconventional monetary policy which affect the supply of securities (cf. Corradin and Maddaloni 2017; Dufour et al. 2020). Due to the nature of specialness, the demand for special securities increases around reporting dates, as is reflected in the seasonal movements of repo rates towards the end of the year.

GC and SC repos can be further distinguished into *cash-driven* and *securities-driven* repos. The difference is which bank initiates the transaction and which prices are charged (Brand, Ferrante, and Hubert 2019). A cash-driven repo would be initiated by Euro Area Bank B. This could likely be a GC repo that is concluded when a bank needs to borrow reserves, e.g. because it finds itself in a deficit position after clearing and settlement. By contrast, a securities-driven repo would be initiated by Euro Area Bank A. For instance, this may but does not have to be an SC repo through which Bank A seeks to obtain a specific security.

Moreover, GC and SC repos can be carried out over-the-counter or via a Central Counterparty (CCP). Central clearing is a discretionary feature of repo markets, which aims at lowering exposures for both lenders and borrowers. Whilst repos—and their contractual details—are determined in the matching process through brokers (e.g. Eurex Repo), as soon as the repo contract is agreed, the CCP (e.g. Eurex Clearing) takes on the legal claim and liability with the respective sides of the trade.

Figure 17 visualises the balance sheet mechanics if a CCP is involved. Bank B creates the repo liability, which the CCP holds as an asset; Bank A holds the repo claim, which is issued as a liability by the CCP. Both banks exchange the reserves directly, and Bank B changes the status of the security from held outright to encumbered. In addition, Figure 17 shows how both banks have to make margin payments to the CCP by transferring reserves to the CCP, which in turn grants deposits to both banks. If the market value of the security fluctuates during the maturity of the repo transaction, the CCP can use the deposits of Bank A and B in order to make some redistributions mirroring the changes in market-value (CCP12 2018).

**Figure 17—Secured interbank lending via repo organized through a CCP**

Euro Area Bank A (repo lender)		Euro Area Bank B (repo borrower)	
- Reserves + Repo (to CCP)	+ Reserves	+ Reserves	+ Repo (to CCP)
- Reserve (to CCP) + Deposit (at CCP)		- Reserve (to CCP) + Deposit (at CCP)	
Banks A's Off-Balance-Sheet Positions			
+ Security	+ Security due	- Security + Security due	
CCP			
+ Repo (to B)		+ Repo (to A)	
+ Reserve (from A) + Reserve (from B)		+ Deposit (of A) + Deposit (of B)	

Table 3 provides an overview on the different CCPs that are operating in Europe. The largest ones in terms of volume are the German *Eurex Clearing AG* and the French *LCH SA*. Each of these CCPs has different specializations and focuses on clearing specific asset classes or market segments. For instance, Eurex Clearing AG is the provider of repos based on larger baskets called “GC pooling repos”. The Euro GC Pooling ECB Basket includes assets eligible for transactions with the ECB such as

**Table 3—Overview on the most important CCPs in the Euro area**

Name of CCP	Country	Average number of daily traded contracts (2020)
LCH.SA	France	5.5 m
Eurex Clearing AG	Germany	5.1 m
ICE Clear Europe Ltd	United Kingdom	5.0 m
Cboe Clear Europe (formerly EuroCCP)	Netherlands	4.65 m
CME Clearing*	United Kingdom	3.8 m
Euronext Clearing	Italy	0.68 m

\* Includes Europe, Middle East, and Africa.

LME Clear	United Kingdom	0.43 m
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Sources: Authors' own calculations based on CCP websites<sup>†</sup>

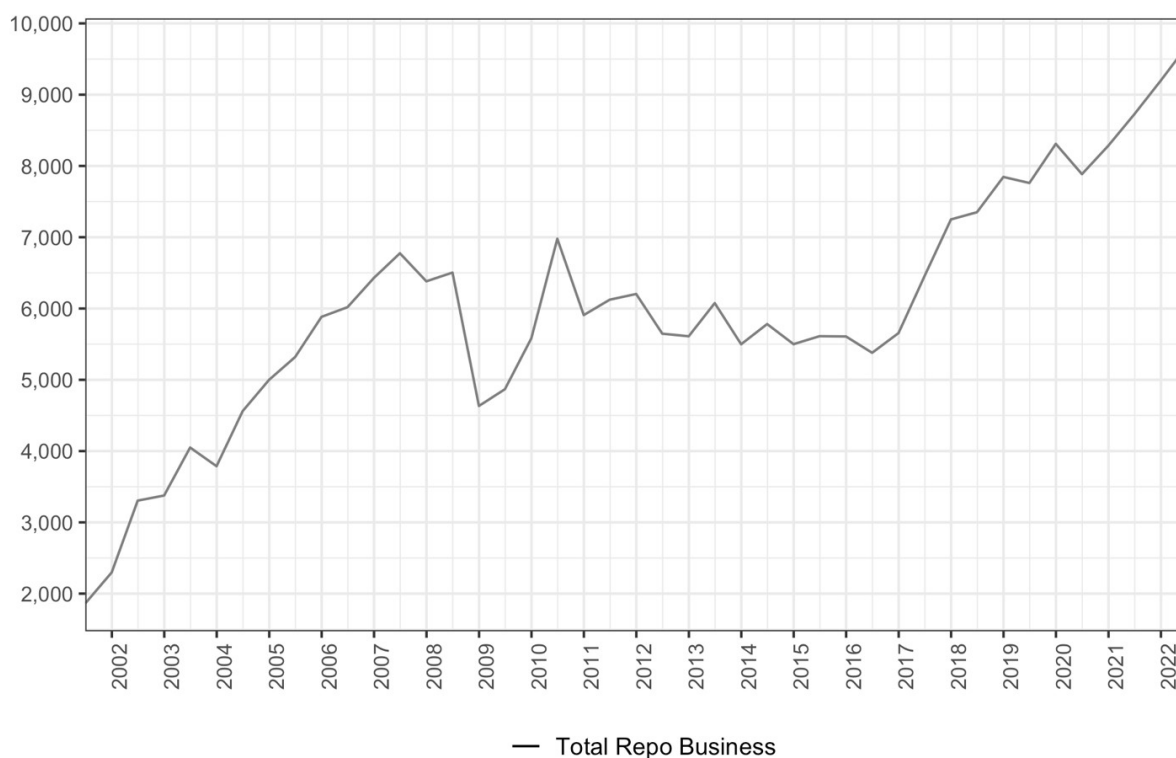
instruments of local and regional governments and supranational institutions on (Brand, Ferrante, and Hubert 2019). By contrast, Euronext Clearing—formerly called Cassa di Compensazione e Garanzia S.p.A.—specializes on clearing Italian government, corporate, and supranational bonds.

Figure 18 presents an empirical overview on the quantitative evolution of European repo markets from 2001 to 2022. The data is based on the questionnaire of repo market participants organized by the International Capital Market Association (ICMA) and comprises GC repo and SC repo, both over-the-counter and organized via a CCP (ICMA 2022). As the numbers are based on the self-disclosure from market participants, the data reliability is much lower than in the case of the vertical repos with the Eurosystem. While the aggregate volume of over-the-counter repos is simply unknown, the data exists for repos organized via CCPs but it is not publicly available. Albeit merely an approximation, the ICMA data in Figure 17 clearly shows a significant increase in repo market activity in the early 2000s after EMU became effective and a sharp drop in volume in 2008 in the context of the GFC (cf. Gabor 2016). The more important movement, however, is the rapid increase by more than 2 trillion EUR between 2008 and 2010, pointing at the fact that repos recovered quickly after the GFC because of their lower risk compared to unsecured interbank loans. After the GFC, repo market volumes stalled and rates of different GC baskets and SC repos were repeatedly in turmoil, which is connected to both the start of APPs and Basel III regulations coming into effect (ICMA 2015; 2017).

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<sup>†</sup> The numbers do not include open interest contracts.

**Figure 18—Total repo business in Europe, 2001-2022 (in bn EUR)**



Source: ICMA Repo Survey (ICMA 2022)

As part of the European repo market's transformation, the relative importance of SC repos and GC repos has shifted profoundly throughout the last two decades. Traditionally, GC repos were the more important instrument. These roles, however, began to reverse after the GFC. As a result, the turnover of SC repo was almost five times bigger in 2019 than that of GC repo (Schaffner, Ranaldo, and Tsatsaronis 2019). Three reasons stand out in particular. First, the Basel Committee on Banking Supervision introduced some regulations such as minimum leverage ratio (MLR) and net stable funding ratio (NSFR) which require banks to maintain enough short-term capital to avoid dry-ups. These made cash-driven repos decline in volume and importance (Grill et al. 2017), which declined as financial institutions sought to acquire more control over their collateral management. Second, the Eurosystem's APPs were a major game changer. On the one hand, the asset purchases have reduced the amount of collateral circulating and thus increased the need to borrow specific collateral via SC repo. In particular, government securities have become scarce due to the design of the PSPP and the PEPP. On the other hand, the asset purchases have increased the volume of EUR-denominated excess liquidity in the system and thus reduced the need to obtain reserves via GC repo. Third, the use of Italian bonds in SC repos increased dramatically and gained the largest market share. As German bonds have safe-haven status, banks tend not to part with them regardless of the premia. This effectively promoted the use of Italian bonds, which are not regarded as a safe haven and continued to be used intensively post-2009 (Schaffner, Ranaldo, and Tsatsaronis 2019).

#### 4.2 The General Collateral Repo framework and its transformation

Just as central banks with their collateral framework, CCPs have the ability to influence the elasticity space on their balance sheet and, in consequence, on the balance sheets of the repo counterparties by defining eligible “collateral baskets”. This applies specifically to GC repo and the associated “GC baskets”.

While the Eurosystem’s collateral framework is centrally decided by the ECB Governing Council and applies to all NCBs, these GC baskets differ from CCP to CCP. This difference to vertical repos no longer appears so substantive, however, if we bear in mind that the Eurosystem originally had a heterogenous collateral framework with eligible Tier-2-assets differing from NCB to NCB. Even more importantly, the bandwidth of collateral eligibility for different CCPs is not so large as one could expect because CCPs tend to follow the Eurosystem’s decisions about eligible repo collateral (cf. Eurex 2023). In that sense, the GC repo collateral framework acts as the extended private arm of the Eurosystem’s collateral framework and amplifies the impact of changes to the Eurosystem’s collateral framework as a *de facto* policy tool. At the same time, CCPs’ collateral baskets have changed in the past following ECB’s monetary policy interventions or lack thereof, which implies that the “extended private arm” is not controlled directly by the ECB.

To substantiate this point, [Figure 19](#) explains in more detail how the CCP balance sheet is designed, drawing on an idealized example of Eurex Clearing. The part of the balance sheet above the wavy line reflects the actual CCP part where all repo claims are matched by repo liabilities. This notation style portrays a deconsolidated gross perspective on CCPs (cf. Murau and Giordano 2023) and highlights how the CCP is in the position to define the collateral that is eligible for repos. The part below the wavy line depicts the actual assets and liabilities of the CCP. It holds reserves, deposits, and liquid securities as assets which it has received through loans from banks that are called “default funds”. As a contingent asset, CCPs are recipient of liquidity insurance from banks.

**Figure 19—CCPs’ balance sheet and eligible collateral following Eurex Clearing (as of 1999)**

CCP	
Repos Against <i>DE sovereign bonds</i> <i>DE mortgage bonds (“Pfandbriefe”)</i> <i>Other securities</i>	Repos
Reserves Deposits Bonds	Deposits Default funds  <i>Equity capital</i>
Liquidity insurance (from banks)	

The “list of eligible collateral” lists the eligible collateral that counterparties can use to make their quotes for GC repo. It is written in a similar way as for the Eurosystem’s collateral framework and consolidates the brokerage of the repo by Eurex Repo and the clearing by Eurex Clearing. Figure 19 depicts the situation in 1999 when monetary unification had just come about. At that time, the EMU had de facto 15 different national repo markets, as lamented by an influential report of the Giovannini Group (1999). This “fragmentation” implied, for instance, that Eurex—as a German CCP used almost exclusively by German counterparties—concluded repo contracts using almost exclusively German securities as collateral. As to Giovannini Group (1999, 29–30), the German repo market was not very developed at the time and had two main segments: a highly liquid market for German government bonds (“Bunds”) and a younger market for German mortgage bonds (“Pfandbriefe”). Other securities, in particular non-German ones, were in principle available but not widely used.<sup>‡</sup>

At the time, the fragmentation into 15 different national repo markets was seen as standing against the vision of full monetary integration (Braun 2020). The ECB lamented that it hampered the transmission of the single monetary policy (Santillán, Bayle, and Thygesen 2000). Cross-border repo transactions were more expensive than domestic ones due to differences in the legal treatment of repos between EMU member states (Hartmann, Maddaloni, and Manganelli 2003, 5) and problems regarding the cross-border recognition of collateral (Stadler and Lannoo 2000). The Giovanni Group was put into force by the European Commission as an expert group that assembled private and public sector representatives to work out proposals to overcome the fragmentation and build a unified EU-wide repo market (Gabor and Ban 2016). The general recommendation of the 1999 report was “to enable participants in every Member State to deal across the spectrum of Member State counterparties and across the spectrum of Member State securities adopting a single, cost efficient, approach and infrastructure platform” (Giovannini Group 1999, 5).

To turn the proposals of the Giovannini Group into law, the European Parliament and the Council adopted a Directive on Financial Collateral Arrangements (Directive 2002/47/EC) in June 2002 which made EU member states remove constraints on using repos cross-borders within the Euro area (Gabor and Ban 2016, 618). Through directives, the EU’s supranational institutions provide binding guidelines that member states have to translate into domestic law. The stated goal of the “Collateral Directive” was to create a harmonised EU-wide regime for collateral usage for repos. As its key points, the Directive stipulated that in all EMU member states, repos should involve a full legal transfer of ownership of the collateral, which is called Title Transfer Collateral Arrangement (TTCA); collateral takers (i.e. repo lenders in our terminology) should have full right to re-use the collateral until the repo matures; it should be possible to deliver at maturity not only “identical” but also “equivalent”

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<sup>‡</sup> Giovannini Group (1999, 29-35) gives an overview on the institutional setup of the repo markets in all 15 EU countries at the time.



collateral; and repos were to be given preferential treatment in case of the insolvency of one of the counterparties.

A primary goal in this process was to make sure that the government securities of all Euro area member states were treated as equivalent collateral on private repo markets, as was already the case in the Eurosystem's collateral framework at the time through the definition of tier 1 collateral. No difference should be made between a repo that used German bonds as collateral and one that used Greek bonds. As the 2002 Collateral Directive treats private and public repo markets equivalently, the new regulations of the cross-border regime applied in principle not only to private lending through horizontal repos, but also to the monetary policy instruments of the Eurosystem through vertical repos. Conversely, the regulations about eligible repo collateral stipulated in the Eurosystem's collateral framework could also be seen as impacting what counts as eligible collateral on private repo markets, even though not in a direct or legally binding way. Eurosystem decision-makers were keen on harmonising collateral regulations not only across countries but also between public and private repos. For instance, as stated in ECB (2002, 68), the ECB felt "a certain responsibility" to "create awareness and co-ordinate efforts wherever necessary" to promote "the integration of the national repo markets into one unified market" and "support initiatives identified as marking progress toward market integration". Gabor and Ban (2016) refer to a coordinated public-private coalition, operating particularly through the Giovannini group, which sought to ensure that the stipulation in the Eurosystem's collateral framework also applied to private repo markets.

These efforts were brought to fruition in March 2005 when Eurex was the first CCP to introduce general collateral pooling for private repos and offered a harmonised GC basket that treated all Euro area government securities as equivalent (BearingPoint 2006, 5). [Figure 20](#) visualises those changes on the idealised Eurex balance sheet. The new GC basket offered a new option for collateralising repo transactions; in that GC basket, all sovereign bonds were treated under the same risk conditions and with the same haircut. However, it did not replace other options to collateralise repos. It was still possible to use the established domestically-oriented repo practices, and there were many other GC baskets in place that defined different types of securities such as bonds and equities as equivalent.

**Figure 20—CCPs’ balance sheet and eligible collateral following Eurex Clearing (as of 2005)**

CCP	
Repos Against <i>GC basket (Euro area sovereign bonds)</i> <i>Other GC baskets</i> <i>Other securities</i>	Repos
Reserves Deposits Bonds	Deposits Default funds  <i>Equity capital</i>
Liquidity insurance (from banks)	

When LCH Clearnet, Eurex’s French counterpart, introduced similar regulations in 2007, the equivalent treatment of all Euro area government bonds had become the industry standard (Braun 2020, 403). The fragmentation of Euro area repo markets declined. Cross-border repo lending on the basis of the GC baskets soared. At the time it seemed that a fully integrated European repo market had emerged, in which it would be the norm that, for instance, an Italian bank would enter into a GC repo contract with a French bank at Eurex as a German CCP using Greek sovereign bonds as collateral.

The arrangements, according to which all Euro area bonds would be treated as equivalent collateral, changed drastically in the Eurocrisis (Mancini, Ranaldo, and Wrampelmeyer 2016). When the GFC of 2007-9 hit the Euro area, the risk aversion of cash providers grew and investors got involved in a flight-to-safety towards German and French bonds. The spread between A-rated Greek bonds collateralised repos and AAA-rated German collateralised repo raised from 0 to 60 bps in September 2008 (Hördahl and King 2008). At that point, distinct risk profiles for sovereign bonds based on their issuer emerged. As a result, CCPs stopped using Euro area-wide GC baskets (Gabor and Ban 2016, 631). Instead, several domestic GC frameworks emerged such as “GC French Bonds” and “GC German Bonds” (Eurex Repo 2021). In consequence, a new form of fragmentation arose within the European interbank repo market, now in between types of GC baskets.

Figure 21 shows this transformation of CCPs’ collateral framework on-balance-sheet. Rather than using a single Euro area-wide GC basket, the list of eligible collateral now is fragmented along the issuing agency as different domestic GC baskets appeared. Each domestic GC, such as German (DE) bonds, encompasses debt securities of a specific Euro area member state. For example, DE bonds comprise several baskets with different asset classes such as “German Corporate Bond GC Basket”, “German Jumbo GC Basket”, or “German Laender 10 Years Bond GC Basket”. The quality of the asset in each GC basket is heterogeneous. In the German Corporate Bond GC Basket, for instance, securities must have an “A-” or

higher rating from agencies such as Standard & Poor’s (Eurex Repo 2021). This transformation of CCPs’ eligible repo collateral is the state of affairs today.

**Figure 21—CCPs’ balance sheet and eligible collateral following Eurex Clearing (as of 2024)**

CCP	
Repos Against <i>Domestic GCs A- bonds</i> <i>GC baskets (DE securities)</i> <i>GC baskets (FR securities)</i> <i>GC baskets (IT securities)</i> <i>Other GC baskets</i> <i>Other securities</i>	Repos
Reserves Deposits Bonds	Deposits Default funds  <i>Equity capital</i>
Liquidity insurance (from banks)	

In sum, our proposed methodology for representing horizontal repos on-balance-sheet helps understand and systematise the profound transformations of the Euro area interbank market since the inception of EMU. First, the methodology shows how horizontal repos serve to borrow and lend pre-existing money but do not involve new money creation. Second, the methodology clarifies how repo borrowers’ IOUs are held as assets on the repo lenders’ balance sheets whilst the securities pledged as collateral are not swapped and remain on the borrowers’ sheets in an encumbered status. Third, the methodology allows an on-balance-sheet representation of the changing private sector collateral rules that to some extent mirror those of the Eurosystem. Creating an integrated Euro area-wide repo market with harmonised collateral rules for both central bank and private repos was a priority of both the ECB and the European Commission in the early 2000s. This strategy got implemented through the organization of CCPs’ GC baskets, which exercised a profound role on the elasticity space available in the Euro area’s monetary architecture.

## 5. Conclusions

This paper has used balance sheet methodology to provide a conceptual and empirical analysis of repos in Europe. We have proposed a methodology that helps understand “encumbrance” of the security used as collateral and clarifies under which conditions money creation takes place. Repos entail an act of money creation when they are vertical repos, between a hierarchically higher and a hierarchically lower institution. This finding is based on the understanding of the Money View that credit money creation—in the narrow sense of the word—implies a “swap of IOUs” as a specific type of balance sheet operation that simultaneously expands the balance sheets of both counterparties involved. Horizontal repos do not entail money creation.

As the two case studies have served to demonstrate, our proposed notation style contributes to seeing through the inherent ambiguity of repo transactions. It clarifies where repos involve credit creation—both in the form of “traditional” money and a repo IOU—and what happens with the security that from a legal perspective is being sold. At the same time, it allows to add complexity and make sense of additional aspects of repos discussed in the literature. This underpins our general claim that our notation style is comprehensive with its distinction between vertical and horizontal repos and its analysis of the whereabouts of the collateral which current regulations interpret as encumbrance.

While our take on repos is “technical” in the sense that it uses balance sheets in order to provide an analytically sound analysis and demystify the instrument, our methodology can serve as a starting point to explore the underlying political economy. Ever since the Fed has introduced the instrument a little over a century ago, the use of repos has proliferated, both in private markets and among central banks. We propose four avenues for future research.

First, it will be interesting to further explore if and how the ambiguity of the repo mechanism has been an integral part of repos’ success story. From our perspective, the inherent ambiguity of repos allows institutions to enhance the elasticity space on their balance sheet and circumvent regulations that would otherwise restrict it—for instance, in the form of restrictive monetary policy mandates as in the case of the Fed during the First World War or in the form of banking regulation such as the Glass-Steagall-Act. In this way, repos are used to promote the ongoing expansion of the credit network while at the same time giving actors and regulators the impression that the collateralisation with a security has a disciplining effect and allows for a greater degree of safety.

Second, an important point that we have not touched upon on this paper but that warrants further conceptual and empirical investigation is the re-hypothecation or re-use of collateral (CGFS 2013, 17), which the EU’s 2002 Directive on Financial Collateral Arrangements has explicitly endorsed. In our view, re-hypothecation and re-use refer to the same balance sheet operation—namely that once a bank has obtained a security via a repo, it is allowed to lend the same security and borrow

money itself by posting it as collateral. This may be in the form of either a horizontal or a vertical repo. *Re-hypothecation* is used if the repo transaction involves merely a pledge like in the US model whereas *re-use* is a concept applied if the security in the repo transaction is subject a full transfer of ownership like in the European model. Questions that would be worth exploring are how to depict the re-hypothecation or re-use of collateral on-balance-sheet drawing on the methodology proposed in this paper; whether it is appropriate to apply a money multiplier logic on the re-hypothecation or re-use of repo collateral; and what role the re-use of collateral plays empirically for the working of the European monetary architecture.

Third, a reason for using vertical repos instead of outright purchases as monetary policy instruments is that, in normal times, they allow central banks to backstop government securities without having to directly accept them on their balance sheet. By using repo as a balance sheet mechanism, government securities do not actually touch the Eurosystem's balance sheet; instead, they remain on banks' balance sheets which thus provide funding to the treasuries that had issued the securities in the first place. NCBs have a claim of ownership on the collateral posted but unless the borrower defaults on the repo, the security technically does not enter the central bank balance sheet. Future research may investigate whether this may be interpreted as a technical bypass of the provision against monetary financing in the Maastricht Treaty by creating a source of demand for government securities. The banks can use the security to access the repo refinancing through the NCB, which is alone in charge of limiting the quantity of repos, either through its collateral framework or through the size of the programmes.

Finally, we believe that the role which the European repo market played in the European sovereign debt crisis warrants more conceptual and empirical research. Our hypothesis is that in the early crisis period, horizontal repos supported cross-border interbank lending from the Euro area "core" to the "periphery" when unsecured cross-border lending froze and thus prevented the total crumbling of the Euro area money markets. Later in the crisis, however, horizontal repos were an essential mechanism in the spill-over of contraction dynamics from treasury balance sheets of Euro area "peripheral countries" such as Greece, Portugal, Ireland, and Spain to bank balance sheets in Euro area "core countries" such as Germany, France, and Belgium. With the centrality of repo for cross-border lending, the collateral framework acquired importance as a new systemic variable, which could be used by the ECB as a relatively new policy tool and by the markets through CCPs as an amplifier of contraction dynamics. We believe that our proposed methodology can provide an on-balance-sheet explanation of how the financial solidity of treasury balance sheets depended on the demand for their government securities by private repo market participants because they were able to pledge the securities as repo collateral. When the danger of a downgrading of Greek and other bonds appeared, their eligibility as repo collateral was withdrawn, thereby spreading contagion from contracting bank balance sheets to treasury balance sheets.

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